國立中央研究院歷史語言研究所

集　刊

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上　海

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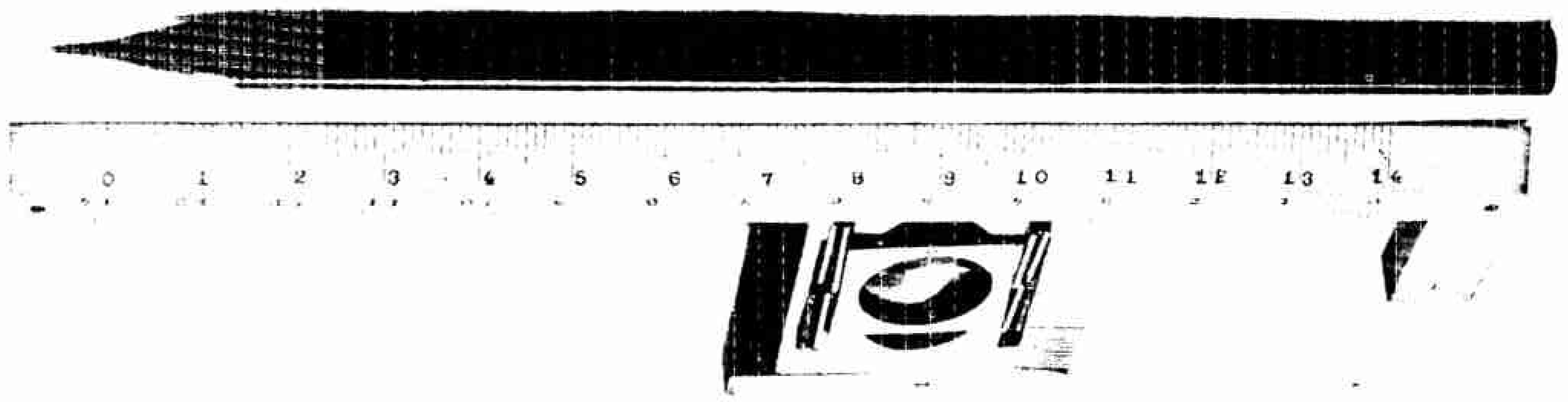
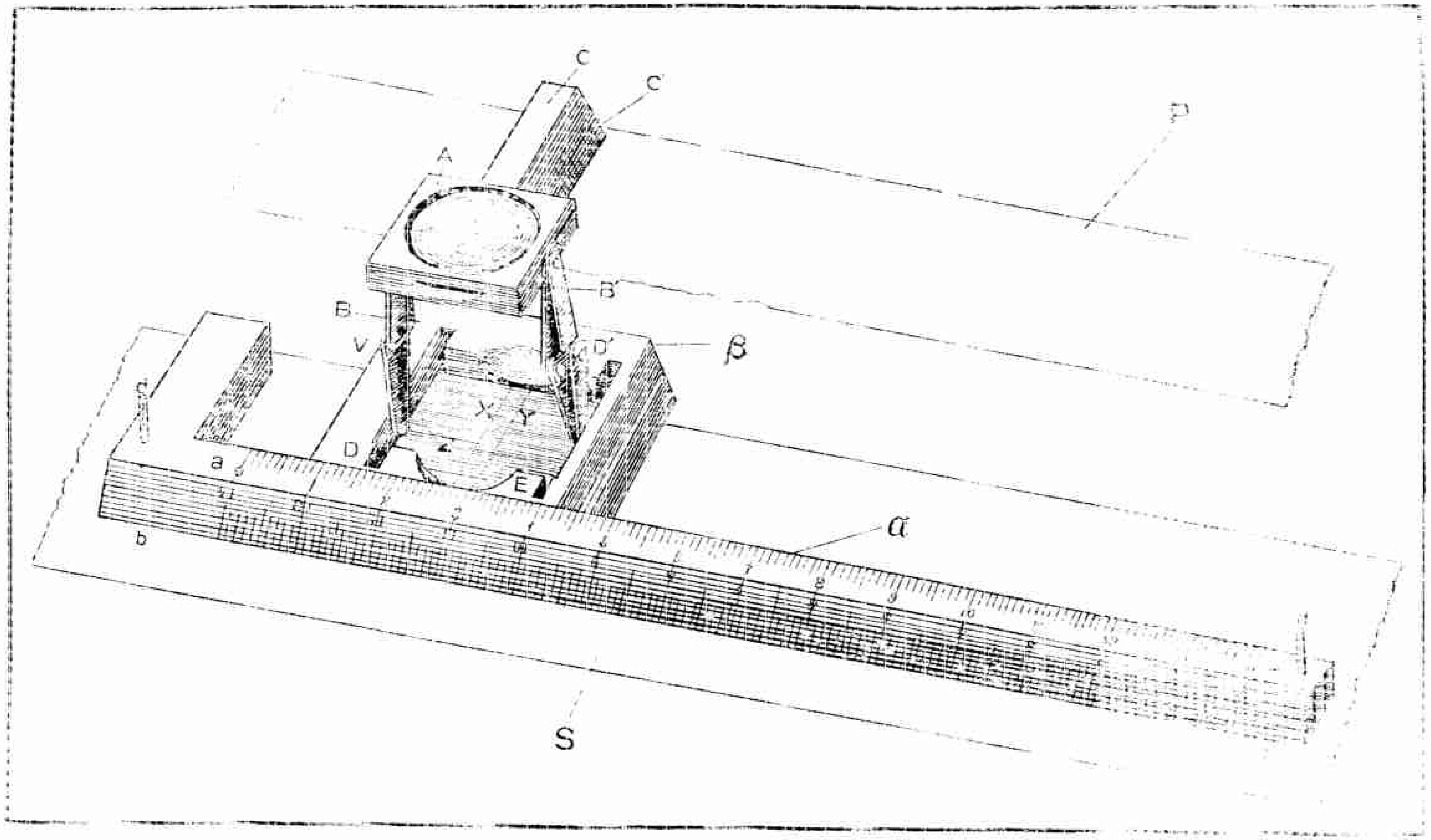
第 一 圖





第三圖

乙二聲調推斷尺

劉　復

我在九年前造過一個聲調推斷尺，其製造原理及使用方法，已寫成一篇文章，在本刊發表。[1]　在那篇文章裏，我說明推斷聲調的方法，共有甲一，甲二，乙一，乙二四種，而聲調推斷尺則依乙一法造成，故可稱之爲“乙一聲調推斷尺”。　近數年來，我覺得這一種尺的製造的價值太貴，而且有相當的體積與重量，在出門調查方言時，行李箱裏放了這樣一件東西，多少總要感覺到些麻煩，所以又根據了乙二法，造成一個輕便尺，可名之曰“乙二聲調推斷尺”。

關於乙二推斷法的理論，已在我從前那篇文章的第11節中詳述，茲不復贅。

現在造成的尺，雖然最大部分是銅質的，可只有一百四十五 grm. 重（合市用制四兩六錢四分），其摺合時的體積，與普通鉛筆相比，如第一圖。

第二圖是將全尺張開預備工作時的式樣。　全體分爲兩部分：一部分是定尺 α，一部分是活尺 β。　這兩部分平時可以分開，到用時纔放在一起。

定尺 α 是一枝很簡單的小曲尺，其長邊與短邊之比，約爲 5 與 1。　長邊的兩頭，有兩個小孔，可以用兩個小針 d,d'插入[2]，把尺固定在平面板上。

a a'面是平的，b b'面是斜坡的；這上面都刻着尺度，自 0 至 140mm.。　a a'面的尺度，用法詳後。　b b' 面的尺度，只是利用空閑的地位刻着，以供普通畫圖或量線之用。

活尺 β 有一個長方形的底座 V D E D'，這底座上面，裝一個八倍力的廓大鏡 A，用 B B'兩活柱支持着；不用的時候，可將這廓大鏡疊入底座之中。

底座的下面，鑲一塊厚明角片[3]，明角片的反面，刻X,Y兩平行線，相距2.5mm.，

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(1)第一本第二分，劉復：聲調之推斷及聲調推斷尺之製造與用法。

(2)可以借用普通留聲機上用的鋼針。

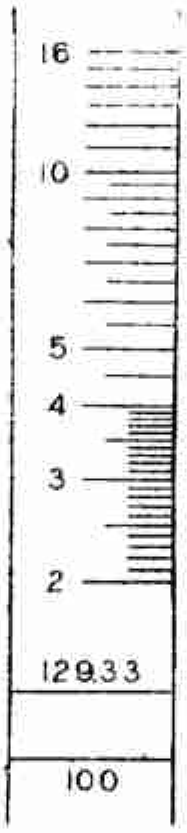
(3)最好是用玻璃，因爲本國製造儀器者還不能在玻璃上刻精細的綫紋，故暫用明角片。

又刻一Z線；線均塗成紅色。

底座左邊的上部，刻一個10:9的 Vernier, V。

底座的左上角，裝一個支尺C。 這支尺可以向右摺疊，與底座合成一正方形。

支尺C的C'面是斜坡的，上面刻着對數線，如第三圖[4]。S是畫着聲浪曲線的煙薰紙，P是預備畫聲調起落線的白紙。 這兩種紙都用圖釘固定於平面板上，與定尺α平行，與活尺β的支尺C作直角。



第三圖

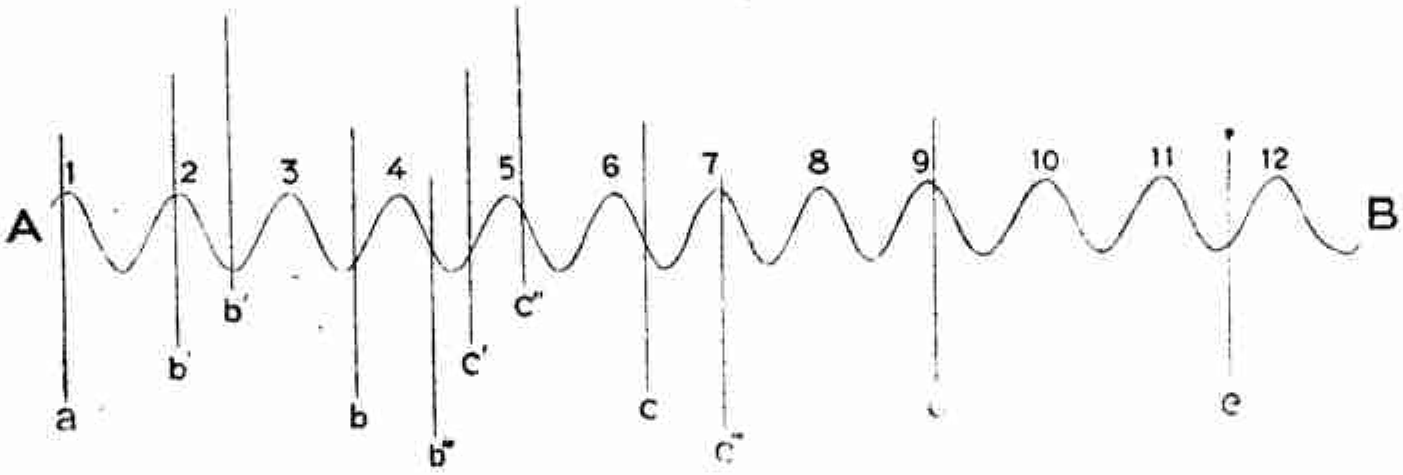
工作的時候，先把活尺的DE邊緊切在定尺的aa'邊上，隨將活尺向左右推動，同時藉着廓大鏡A，直推到看見明角片反面的X線，已落在S紙的某一音的聲浪開始點，於是以左手按定活尺，以右手用鉛筆沿着支尺的C'邊，在P紙上畫一條垂直線（甲）。

再看X,Y兩線之間，包含幾個聲浪，即依聲浪的數目，向支尺C'邊的對數線上去找到一個相當數；隨用鉛筆緊靠C'邊，依此相當數在P紙上作一點。

作點訖，即將活尺向右推動(時時注意活尺的DE邊要緊切定尺的aa'邊），推動的距離愈小，所得的結果愈精密，至多不得超過2.5mm.。

於是再看現在的X,Y兩線之中，包有幾個聲浪，仍依前法作點。

例如第四圖[5]，AB爲聲浪曲線，我們起首時把X線放在a線的地位，則Y線在b



第 四 圖

(4)圖中所畫，比原樣大一倍。

(5)此圖比原樣大十倍，聲浪曲線與原樣黑白相反。

線的地位，看a,b兩線之中，包有兩個聲浪又十分之六，卽靠着支尺C'邊的2.6處做一點。　於是將活尺向右推動 2.5mm.，使X線在 b 線的地位，Y線在C線的地位，看 b,c之間有兩個聲浪又十分之七，卽靠 C'邊2.7處作點。　再將活尺向右推動 2.5mm.，使X 線在 C 線的地位，Y線在 d 線的地位，看 c,d 之間有兩個聲浪又十分之八，卽靠C'邊2.8處作點。　如是類推，直到Y線落在某一音的終點時完畢。　再將活尺向右推動，到X線落到此音的終點時，仍依開首時方法，用鉛筆靠着支尺的 C'邊作一垂直線(乙)。　於是聯絡(甲)(乙)兩垂直綫間的諸點，作一曲綫，卽爲此音的聲調起落綫。

把活尺向右推動，並不必恰恰每次是 2.5mm. 却應當小於此數而不可大於此數。譬如第一次X在 a，Y在 b，得數是 2.6；第二次不是X在 b，Y在 c，而是X在 b'，Y在 c'，得數是 2.7；或X在 b''，Y在 c''，得數也是 2.7，這是把點子加密，所畫曲綫愈加精確。　若然第一次是X在 a，Y 在 b，第二次是X在 b'''，Y 在 c'''，雖然得數仍爲2.7，而 b 與 b'''之間一截沒着落，那就有很顯明的錯誤了。

用上述方法所求出的曲線，只能表示相對音值，不能表示絕對音值。　要表示絕對音值，只須知道記音時烟薰紙每一秒鐘行走的速率，就可以用第五圖的"絕對音值曲綫片"畫出，不必推算。[6]　這曲線片用照像膠片製成，[7] 應用的方法如第六圖。[8]　假定烟薰紙的速率是每秒鐘 65 mm.，而我們所取的音高標準是 C_2=129.33V.D.，我們卽將曲綫片插入支尺 C 之下，而令片上表示 65 的一條垂直綫，與 C'邊相切合，同時片上表示 29.33V.D.的水平綫，與支尺上表示 129.33V.D.的水平綫相接成一直綫，卽於片的上端的曲綫與支尺 C'邊相交之處作一點，是爲M點。　就本圖而論，M點正當C'邊的 5 處，其意卽是如烟薰紙每秒鐘行走65mm.，則X,Y兩綫間包含 5 個聲浪時，其音爲 C_2=129.33V.D.也。（如以 100V.D. 爲音高標準，則於片上表示100V.D. 的水平綫與C'邊表示100V.D.的水平線相接成一直線時作點。）

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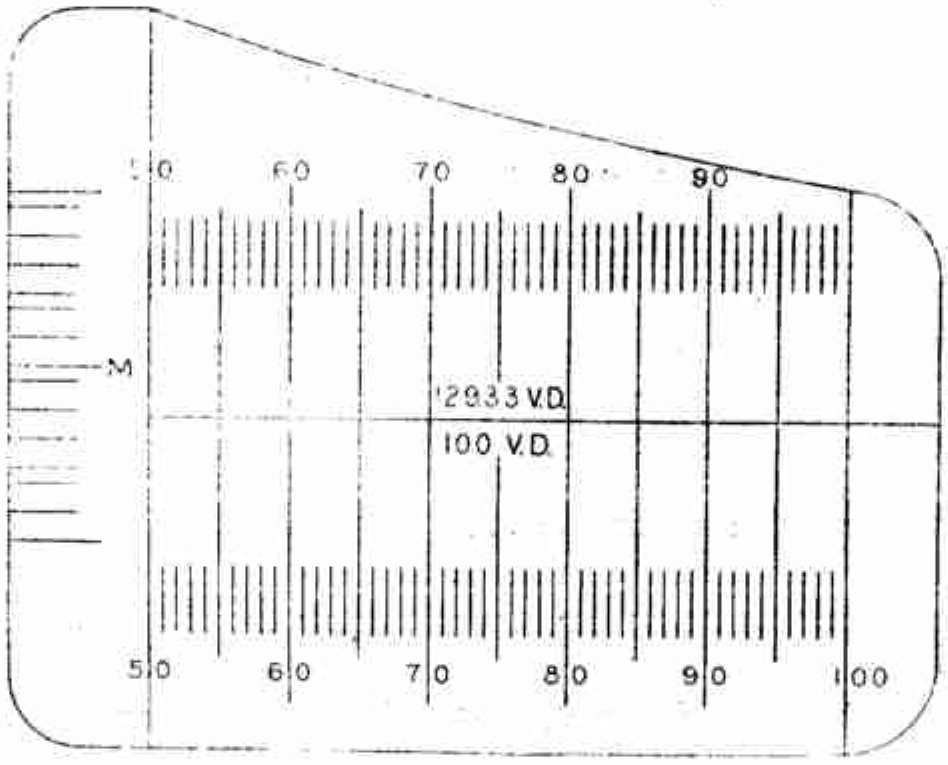
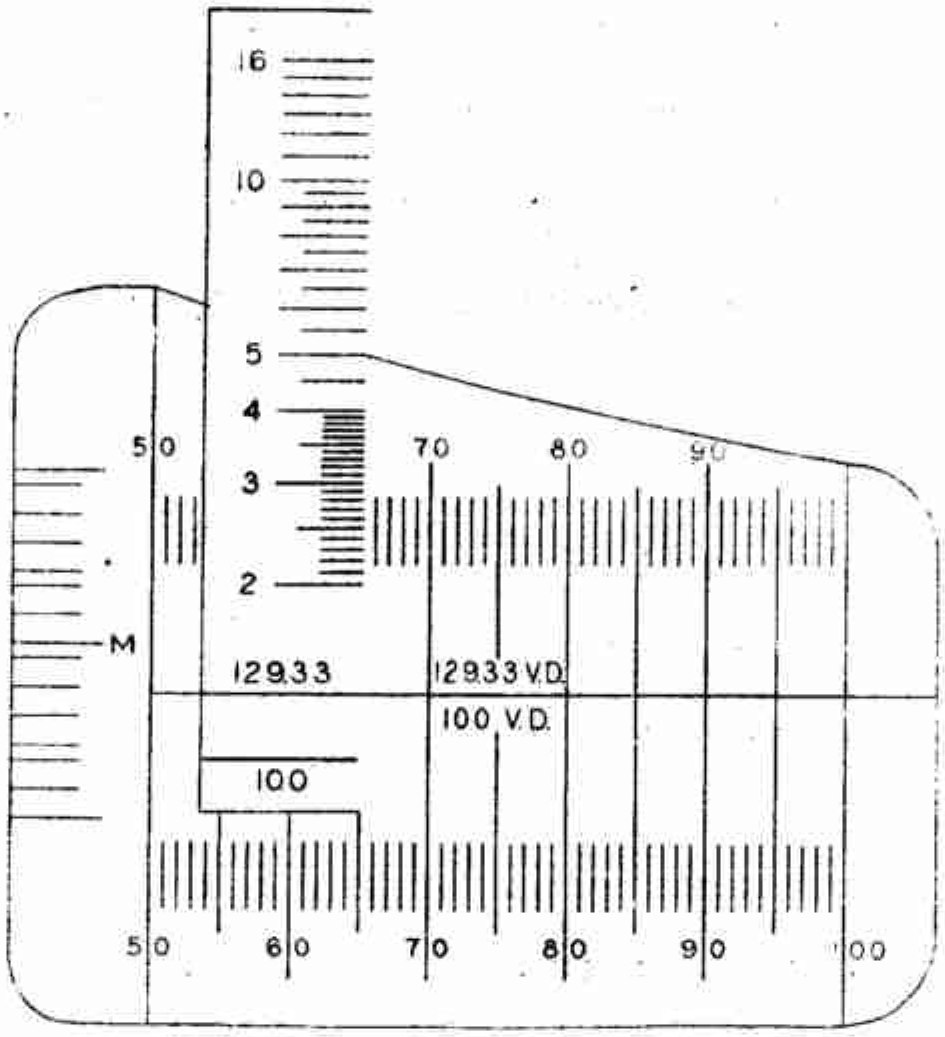
(6) 此圖比原樣大一倍。

(7) 最好是用薄鋼片製，因爲刻鋼片價值太貴，而且不容易做得正確，所以先畫了一個放大十倍的圖，用照像法縮小之後，再翻印在膠片上。

(8) 此圖比原樣大一倍。


50
60
70
80
90
M
129.33 V.D.
100 V.D.
50
60
70
80
90
100

第　五　圖

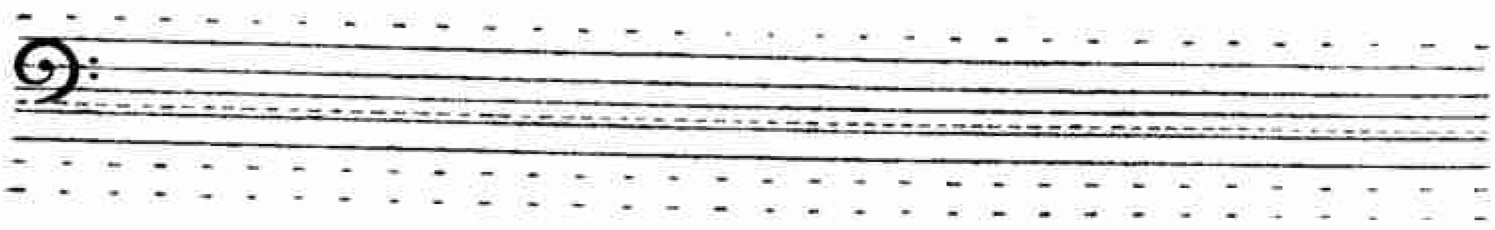

16
10
5
4
3
2
50
70
80
90
M
129.33
129.33 V.D.
100 V.D.
100
50
60
70
80
90
100

第　六　圖

這M點應作於(甲)(乙)兩條垂直線上。　聯絡兩M點，作MM水平線。　更於兩M點之上下，各依曲線片右邊所附小尺作點，兩兩以直線聯絡之，則MM之上下，各有平行線七條。　這些平行線所表示的音值是：

	C_3=258.65V.D.	B_2=244.14V.D.
	A_2=217.50 ,, ,,	G_2=193.77 ,, ,,
	F_2=172.63 ,, ,,	E_2=162.94 ,, ,,
	D_2=145.16 ,, ,,	
(MM線)	C_2=129.33V.D.	B_1=122.07V.D.
	A_1=108.75 ,, ,,	G_1= 96.89 ,, ,,
	F_1= 86.31 ,, ,,	E_1= 81.47 ,, ,,
	D_1= 72.58 ,, ,,	C_1= 64.66 ,, ,,

爲求分外省事起見，我特地計劃了一種能於正確表示音值的五線譜，[6]如第七圖。我們在畫成聲調起落線並MM線之後，就把用透明紙印成的這種五線譜覆合上去，令譜中表示C_2的一條虛線(圖中點子較密的一條虛線)，與MM線符合，即用墨筆將底圖的聲調起落線影抄於五線譜上，於是聲調起落線的絕對音值，就藉着五線譜完全表顯出來了。



第　七　圖

〔就我十多年來實驗上的經歷說，普通男子的語音，高以C_3爲界，低以C_1爲界，其中點是C_2，而受語音實驗的人（Subject），十分之九以上是男人，因此，我們不妨竟定C_2爲"語音學中的中央C"（Phonetic middle C）。[10]　爲記載的簡省起見，我們

(9)普通的五線譜不能把音值正確表出。

(10)音樂中稱C_3爲中央C，C_2爲低C(Bass C)。

可以把中央C（我們的中央C）以上的音，都用小體寫，如c, d, e, f, g, a, b, c', d'、把中央C以下的音，都用大體寫，如 B, A, G, F, E, D, C, B_1, A_1, 這與 Helmholtz 的記載法是符合的。

爲比較或統計高低的方便起見，我們可以把 A. J. Ellis 的"循環百分數"（Cyclic cents）省去兩個 0，而稱之爲"語音學中的音高度"（Phonetic pitch degrees），並定c的度數爲12，c#爲13，d 爲14，由此向上推至 b 爲23，c' 爲 24 ；B爲11，A#爲10，A 爲9；由此向下推至D爲 1，C爲 0 ；C以下用負號： B,，爲-1，或寫作 -$\bar{1}$；A,#，爲-2，或寫作$\bar{2}$；餘類推。[11]〕

要在五線譜之下附加時間的紀載是很容易的。 譬如我們知道烟薰紙的速率是每秒鐘 65mm.，則每十分之一秒爲 6.5mm.；我們可以先在五線譜之下相離兩三mm.處作一條水平線，再將垂直線(甲)引長，與此線正交；次將活尺摺起，橫轉，將其V D邊與定尺的a a' 邊相切，附有支尺C的一邊（這時候支尺C已摺合於底座）與定尺的短邊相切，DE 邊向右；再將定尺的 a a' 邊放在與新作水平線平行或相切的的位置，同時將活尺的 DE 邊放到與垂直線（甲）的引長線相切，是爲起點；於是，藉着 Vernier V 的幫助，將活尺向右推動 6.5mm.（定尺不動），即以鉛筆靠着 DE 邊在水平線上作一點；接着再將活尺向右推動6.5 mm.照樣再作一點；照此作去，直到聲調起落線完了爲止。 於是在起點下注 0；在第一點下注 0.1 ，意即一秒的十分之一；在第二點下注 0.2，意即一秒的十分之二；到滿一秒時，則注 1.0，這就是完成的聲調起落圖了。[12] 下邊的第八圖是周殿福君用北平方音說"中華民國"四字的浪線，及本此浪線所畫成的聲調起落圖，烟薰紙的速率是每秒鐘 80mm.。

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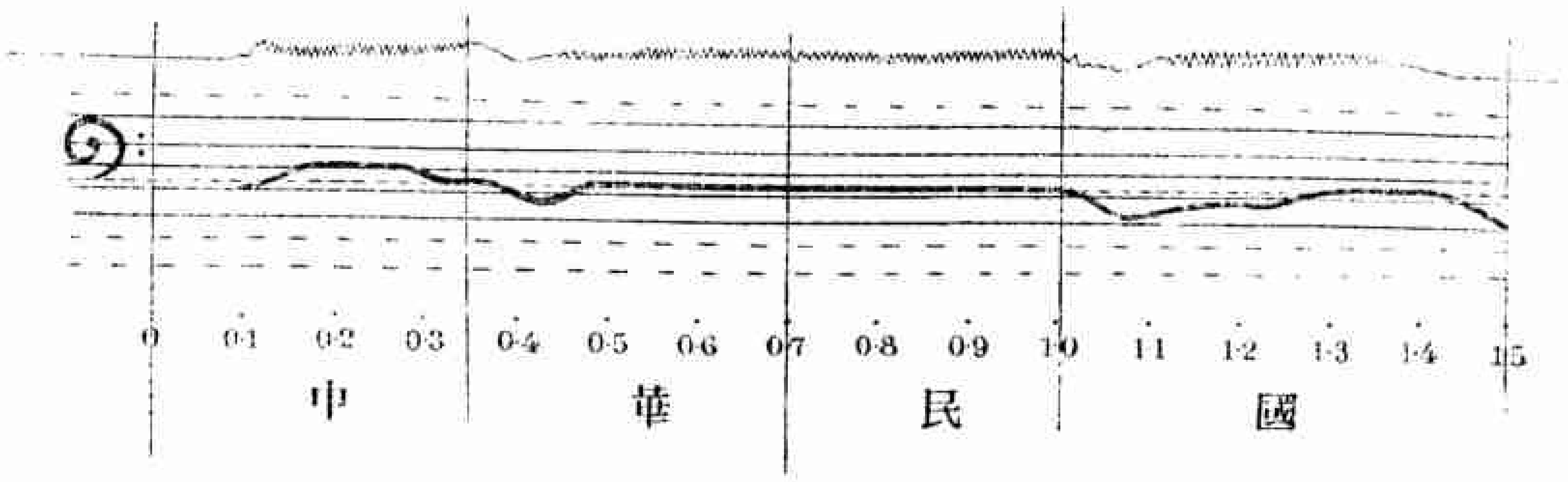
(11)此上兩節，與說明聲調推斷尺無關，只是用聲調推斷尺畫成了聲調起落圖之後，再做推論或統計工作時纔用得着。 因爲這是我最近的見解，自信可以使研究聲調的手續益趨簡易，而所得結果愈加明瞭，故附寫於此。

(12)圖中以十分之一秒爲單位，在比較或統計音長時，却以借用物理學中以一秒的千分之一爲單位更方便，因爲用了這樣的一個小單位，就可以免去用小數的麻煩了。 這單位的名稱叫做 σ (Sigma),我們可以說圖中的0.1是一百個 σ，0.2是二百個σ。



第　八　圖

照前節所述將活尺橫轉，却將廓大鏡A支起，我們就可以借着明角片反面的Z線，以量某一浪線或某一浪線的某一部分之長。　其法，先將活尺的Z線切合於所量浪線的起點，隨將定尺湊合上去，使其短邊與活尺附有支尺C的一邊相切，其a a' 邊與活尺的VD邊相切，於是按住定尺，將活尺向右推動，至Z線與所量浪線的終點切合，卽借 Vernier 的幫助得其長度，其精密度爲 0.1mm. ；既得此數，卽可按烟薰紙的速率，以求時值。[13]

這乙二音高推斷尺是去年冬季造成的，[14]那時白滌洲君正從陝西調查方音回來，他就借了去，請他的新夫人徐溶女士替他作推斷工作。　據徐女士的報告，大約每十二三分鐘可以將一個地方的陰陽上去四種聲調的起落線畫成。　所以，沒有經過許多工夫，只在他們倆的蜜月之中，就把陝西關中區各地所有的聲調起落線完全畫出來了。　這在他們，是個可以媲美於東萊博議的美談；而我造的這一件小儀器，不期竟像造了一隻大輪船，由白夫人來舉行下水禮，也不失爲一種佳話了。

二十三年一月二十九日，北平

(13)卽δ數

(14)民國十九年已造過一個，用法雖簡，仍嫌龐大，去年重新[illegible]計，始成此式。

音位標音法的多能性

趙 元 任

THE NON-UNIQUENESS OF PHONEMIC SOLUTIONS OF PHONETIC SYSTEMS

BY Y. R. CHAO

In reading current discussions on the transcription of sounds by phonemes, one gets the impression of a tacit assumption that given the sounds of one language, there will be one and only one way of reducing them to a system of phonemes which represent the sound-system correctly. Since different writers do not in fact agree in the phonemic treatment of the same language, there arise then frequent controversies over the "correctness" or "incorrectness" in the use of phonemes.

The main purpose of the present paper is to show that given the sounds of a language, there are usually more than one possible way of reducing them to a system of phonemes, and that these different systems or solutions are not simply correct or incorrect, but may be regarded only as being good or bad for various purposes.

I. DEFINITIONS OF A PHONEME.

The most comprehensive discussion of the phoneme and related ideas seems to be that by H. E. Palmer[1], of which we shall now give a brief summary. Palmer begins by quoting at length Jimbo's writing on "The Concrete and Abstract Nature of Sounds." (音の具體性と抽象性) "One concrete sound has one definite quality, one definite pitch, one definite loudness, one definite length," in other words, it corresponds to one particular oscillograph curve or a stretch of the groove of a faithful gramophone record, which is therefore not the usual object of study for phonetics. By collecting examples of actual utterances of what is considered the same word with the same meaning by speakers of the same language of concrete sounds, one arrives at "an abstract sound of the first degree," such as the first sound in the word *army*. By

1. H. E. Palmer, *The Principles of Romanization*, 1931, Tokyo, pp. 52 ff.

comparing *different* words as *army, archer, art, argue*, one concludes, after due examination, that the first sound in these words are "the same," which is then an abstract sound of the second degree.

Taking Palmer's own system, we note that he finds it more convenient to replace the term *abstract speech-sound* by the term *phone*. His system of phones is then as follows:

Phones { Monophones; Metaphones { (1) Contactual phonemes, (2) Free phonemes, (3) Dynamophones, (4) Diaphones, (5) Phonogenes } }

A Monophone is "any phone of the first or second degree of abstraction of which the concrete members are so similar in point of production and of acoustic effect even when observed by a competent observer, that it may be regarded as a minimal unit of pronunciation (i.e. practically insusceptible of sub-division.)" (We may add: "or of further differentiation.") "Contrasted with *monophones* we have *metaphones*, which we may define as two or more phones which serve jointly as units of meaning within the limits of a given linguistic community."

(1) Palmer goes on to identify Jones's definition of a phoneme with his idea of a contactual phoneme: "A *phoneme* is a group of sounds consisting of an important sound of the language (i.e. the most frequently used member of that group) together with others which take its place in particular sound-groups.....The use of subsidiary members of phonemes is, in most languages, determined by simple principles which can be stated once for all, and which can be taken for granted in reading phonetic texts."

(2) A free phoneme is like a contactual phoneme except that it is impossible to say in what phonetic circumstances one or another of its members will be actually used. We can give the apparently random[1] use of the tip or back of the tongue in the nasal ending of words like 因, 今 in Nanking as an example of free phonemes. This is the same as Jones's *variphone*.

(3) A dynamophone is a metaphone which contains two or more phones differing not only in quality, but also in regard to the intensity or force of the articulation that produces them. Palmer cites the first phone in the word *as* as an example which shades from the first phone

1. That is, determined by psychological or physiological conditions other than those which are usually considered to be phonetic.

of *act* to the obscure sound of the first phone of *about*, and even to zero value.

It would seem convenient also to include under this heading metaphones whose members differ according to conditions of length and intonation (in which case a term wider than *dynamophone* will have to be used). Thus, the vowel in French *bette* and *bête* is a metaphone whose members differ slightly in quality according to the conditions of length. Those who transcribe *eat*, *it* as [i˙t], [it] are also considering the vowel in these words as forming one metaphone whose members differ in quality according to conditions of length. Again, the vowel in the Foochow words 哥 and 個 is a metaphone whose members differ in quality according as the intonation belongs to one or the other of two sets of tones.

Before taking up the next two terms, it will be well to examine a later definition of a phoneme given by Jones: "Definition of a phoneme: a family of sounds in a given language which are related in character and are such that no one of them ever occurs in the same surroundings as any other in words. (The term 'language' here means the pronunciation of one individual speaking in a definite style. 'In the same surroundings' means surrounded by the same sounds and in the same condition as regards length, stress and intonation."[1] This definition differs from the earlier one quoted above in that it mentions explicitly "and in the same condition as regards length, stress and intonation." It seems therefore that Jones's conception of a phoneme includes not only Palmer's contactual phonemes, but also some at least of his dynamophones.

(4) The term diaphone is used by Palmer following the usage of Jones: "The *diaphone* is a family of sounds heard when we compare the speech of one person with that of another." Jones cites [oː], [ou], [əu], [ʌu] as members of the diaphone occuring in words like *coat*, *road*, *home*. Similarly, we can cite [ᵊu], [ou], [əu], [ɤ], [ɯ], [øy], [ei], [ɪ] as members of the diaphone occuring in words like 歐, 狗, 後.

(5) The phonogene, a term also proposed by Jones, is "a given phone together with its ancestral forms," thus the vowel [ou] in *stone*, together with [o], [ɔ], [ɑ], form a phonogene. Similarly, [ɚ], [əɹ] [ɹ̩], [ɹi], [ʑi], [ȵʑi] [ɲi], [ni] form one phonogene in words like 兒, 耳, 二.

Bloomfield gives no formal definition of a phoneme. He begins by distinguishing the *gross acoustic features* of language (Jimbo's "concrete sounds" or sounds of low degrees of abstraction) and *distinctive* or *significant features*. By comparing the partial identities and

1. *Proceedings of the International Congress of Phonetic Sciences*, 1932, Amsterdam, p. 23.

differences between words like *pin, tin, tan, tack*, he succeeds in analyzing the distinctive features of words like *pin* into indivisible units which cannot be analyzed any further (from the standpoint of the language under investigation) : each of these units is "a minimum unit of distinctive sound-feature, a phoneme,"[1] which phrase is the nearest Bloomfield comes to a formal definition of a phoneme.

Differences of quality conditioned by length are grouped by Bloomfield under the same phoneme, as German *Beet* [be:t], *Bett* [bet]. He also writes *hatte* [ˈhate] where the stress on the first syllable indicates sufficiently the weakened and obscure value of the second vowel. Bloomfield's phoneme therefore also includes Palmer's dynamophones.

Bloomfield makes no explicit mention of free phonemes or variphones. In cases like the apparently random use of final [n] and [ŋ] in some Chinese dialects for the same word in the same phonetic surroundings, he would probably consider simple nasality as being the distinctive feature and the place of articulation as among the gross acoustic features. In other words, variphones are also phonemes, except that the choice of the exact shade of the sound used is determined by psychological and physiological factors other than those of phonetic environment. Since, however, whether variation of sounds determined by non-phonetic conditions are wide enough to be called two or more "different" sounds or simply inevitable small "accidental" variations depends upon the degree of narrowness of the phonetician's scale of division, Bloomfield is within his rights in neglecting the existence of variphones.[2]

From the preceding, it may seem that Bloomfield has a different conception of the phoneme from that of Jones and Palmer. For Jones and Palmer, a phoneme is a group of sounds, while for Bloomfield it is a sound-feature. If, however, we examine the two ideas more closely, we shall find that they amount to the same thing. Take for example the English phoneme [h]. From one point of view, we may say that it is a group of different sounds [h_i]. [h_e]. [h_a]. [h_u] etc., where the subscripts are indication of the tongue and lip positions during the pronunciation of the consonant. But from the other point of view, we may just as well say that the phoneme [h] is simply the feature of voiceless glottal friction and leave the other non-significant features unspecified. There is therefore no real difference in the use of the term phoneme by those writers, so far as this point is concerned.

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1. Leonard Bloomfield, *Language*, 1933, New York, p. 79.

2. See however III below on the finiteness of the number of distinguishable speech-sounds.

For the present discussion, we shall group together Palmer's contactual phoneme, free phoneme, and dynamophone, all under the term phoneme, to be defined as follows:

A phoneme is one of an exhaustive list of classes of sounds in a language[1], such that every word in the language can be given as an ordered series of one or more of these classes and such that two different words which are not considered as having the same pronunciation differ in the order or in the constituency of the classes which make up the word.

Observations:

(1) This definition presupposes that it is possible to enumerate exhaustively the total number of phonemes for any given language.

(2) It does not exclude the possibility of the same sound belonging to more than one class (Cf. II 2 (f), (g) below).

(3) It is non-committal as to whether given a language, there is one unique way for grouping its sounds into phonemes or there are other possible ways.

(4) It leaves unspecified the scope of the word "sound" as regards size and kind, i.e. the degree of analysis into successive elements and the degree of differentiation into kinds.

(5) It includes both the cases where given the phonemes in a word and its phonetic environment, it is possible to determine the actual pronunciation of the word by a set of "rules of pronunciation" (i.e. to know which member-sounds of the sound-classes will actually be used) and those cases where a given word in a given phonetic environment may still contain a phoneme of which one or another member may be used. The former would be a contactual phoneme or a dynamophone and the latter a free phoneme. (This remark, however, would be superfluous if we repudiate the validity of descriptive phonetics, with its narrow transcriptions.)

(6) The clause that every word consists of a series of "classes" may sound a little strange. But if, as it is convenient in the study of languages, to speak of recognizable words consisting of recognizable phonemes, then such phonemes are usually *classes* of sounds, which a trained ear would distinguish as different sounds. The statement sounds no more strange than that 1, 2, 3, 4 are a series of "classes", which is what mathematicians define numbers as.

1. Taken in the sense of the pronunciation of a homogeneous speech community, such that members of the same community will find absolutely no "accent" in one another's speech.

(7) If each phoneme is written with one definite symbol, then every word will have a definite form of transcription. Homophones, or different words having the pronunciation, will be transcribed alike. It should be noted, however, that the boundary between a homophone and a word with variations in meaning is often hard to determine.

(8) A phonemic transcription is pronounceable without reference to grammatical or lexical consideration. Thus, the Chinese National Phonetic Script and the National Romanization are phonemic transcriptions in a sense in which English or even German orthography is not.

II. FACTORS WHICH INFLUENCE THE PHONEMIC SOLUTIONS OF PHONETIC SYSTEMS

As the grouping of sounds in a language into phonemes as defined above does not necessarily lead to one unique solution, we shall now consider the various factors which influence the form of the solutions.

1. Size of unit in time.—

(a) *Under-analysis.*—In the early days of phonetic transcription, the slogan was "one sound, one symbol." In these days of phonemic transcription, this has been changed to "one phoneme, one symbol," so that it is now permissible to represent more than one sound by one symbol.

But there are two aspects to the idea of "one sound." From the point of view of differentiation of quality, "one sound" is one *kind* of sound (一種音), which is what one usually has in mind when using the phrase in discussions about phonemes. But from the point of view of analysis in time, "one sound" is one *piece* of sound (一個音), such that its quality is homogeneous throughout its duration. Discussions about phonemes do not seem to have been very explicit about the change of quality in time which may be included within the scope of one phoneme. We recall that Palmer defines a monophone "as a minimal unit of pronunciation (i.e. practically insusceptible of further subdivision)." All the preceding discussions in the passage quoted have to do with the question of differentiation, but as the words "minimal" and "subdivision" can also be taken in the temporal sense, it would seem that a monophone should be both one *kind* of sound and one *piece* of sound.

Now if it is convenient to group into classes and call phonemes different *kinds* of sounds in a language which go together in a certain way, it would also be convenient to join into compounds successive *pieces* of sounds which act as units in a language. This is by no means new

practice. Our point here is only to make it explicit and put it on a par with the differential aspect of phonemes.

All kinetic speech-sounds, diphthongs, affricates, aspirates, and other sounds with their usual glides are compounds which act as units and can be treated as phonemes. Thus, Bloomfield considers the English affricates [č] and [ǰ] as independent phonemes. The English plosives [p], [t], [k] are treated by all writers as single phonemes, although in initial stressed positions they have a slight aspiration and have a larger *size* than in unstressed positions or after [s] (in [sp-], [st-], [sk-]). In the former case, the inclusion of [č] and [ǰ] is optional. For these could be resolved into the phonemes [tʃ] and [dʒ] respectively. In cases like *he cheats* [hiː ˈtʃiːts], *heat sheets* [hiːt ˈʃiːts], *each eye* [iːtʃ ˈai], *eat shy* [iːt ˈʃai], the distinction may either be made by considering [č] and [tʃ] as different phonemes, as with Bloomfield, or simply by the difference in the position of the minimum point, as with most other writers, that is to say, since the [č] in *each eye* and the [tʃ] in *eat shy* never occur under the same conditions as regards stress, [č] need not be considered as a separate phoneme. In many Chinese dialects, the initial [k] always occurs before low front vowels or central or back vowels, and initials of the [tɕ] type always occur before high front vowels. The two may therefore be taken as the same phoneme, although the latter is an affricate. Similarly, the [t] in [ta] タ, the [tɕ] in [tɕi] チ and the [ts] in [tsɯ] ツ in Japanese may be taken as belonging to one phoneme.

Kinetic sounds of the diphthong type need special consideration. While affricates, aspirates and sounds with characteristic glides can usually be analyzed, if desired, into two or three recognizable elements, kinetic vowels and quasi-vowels are sounds with even more gradual change in quality. The usual method of representing these sounds is simply to indicate the two end-positions of the whole movement, as [ei], or to indicate the open position and the extreme close position even though never actually reached, as [ai] for what is actually never wider than [ae]. In the case of movement not by the most direct line, the turning point is indicated by inserting an additional symbol, as [uei], but not [ɑɔu], as [ɑu] *means* [ɑou] or [ɑɔou].

Now by our definition of a phoneme, there is nothing to prevent us from regarding characteristic kinetic open sounds in a language as independent phonemes, which is in fact the practice of the designers of the Chinese National Phonetic Script, who represent [ai], [ei], [ɑu], [ou] by the single symbols ㄞ ㄟ ㄠ ㄡ, and even [an], [ən], [ɑŋ], [əŋ] by ㄢ ㄣ, ㄤ ㄥ. It may seem unorthodox if we took the National Phonetic Script as serious phonemic transcription, but we should be

less sure of ourselves if we come to cases of narrow-range kinetic sounds. There is a real difference in practice, if not of opinion, between Bloomfield's use of [ij] and [uw] for English and other writers' use of [iː] and [uː] (as contrasted with [i] and [u]); or of [i] and [u] (with implied relative length) (as contrasted with [ɪ] and [ʊ]). Again, in many American dialects, it is a toss whether to write *bet, bait* as [bet], [beit] or as [bet], [beːt], or [bɛt], [bet] (with implied length). The most interesting case of the size of unit question is that of the Foochow dialect, where a whole series of vowels *in the same words* are static or kinetic according to the actual tone in which it is pronounced. Thus, 氣 [k'eiɭ˩] "air", 竹 [tøyk˧] "bamboo," 護 [hou˦] "protect," take on the following sounds when they are pronounced in the following combinations of tonal environment: 氣壓 [k'i˧ ɑk˧] "air pressure," 竹節 [ty˧ ʒaik˧] "bamboo section," and 護兵 [hu˥ ʋiŋ˥] "guards" (protecting soldiers), respectively. We have therefore on our hands the question of choice between (1) admitting phonemes of which some members are static and other members kinetic vowels, or diphthongs, and (2) regarding the static members as forming one phoneme and the corresponding kinetic vowels as two phonemes in succession, thus allowing the same word to have two forms. The presence and absence of the aspiration in English [p], [t], [k] mentioned above is also a similar case, though not so striking.

Another very peculiar case is that of a vowel in a concave circumfelex tone in a number of Chinese dialects, such as the *yangshaang* tone of Hwangyan (黃巖陽上), where the valley is so low or simply so narrow that the voice is lost into a glottal stop in the middle of the syllable, so that [ɔ˨˩˧] actually becomes [ɔ˨˩ʔ ɔ˧]. Phonetically, it sounds like three sounds forming two syllables. But phonemically, it is much more natural to consider it as a form of [ɔ] in a certain tone.

On the whole, the usual practice allows a great deal of latitude in taking kinetic consonants as single phonemes, but not so free in giving single symbols for kinetic vowels. Bloomfield gives a list of eight diphthongs and one triphthong for English, and call them "compound primary phonemes," all their elements occurring also as single primary phonemes.

The chief point we wish to emphasize here is that it is not always advisable or convenient to take the smallest static unit of sound analyzable by the trained ear as the unit of phonemic members ("one *piece* sound, one symbol"), and that according as we take a smaller or a larger unit for our phonemic members, we sometimes arrive at different forms of

phonemic pattern for the same language, which are equally valid, though they may not be equally suitable for this or that purpose.

(b) *Over-analysis.*—The principle of "one piece sound, one symbol" has yet to allow a class of exceptions in the opposite direction, namely, one piece sound, two or three piece symbols. Jones and Camilli give the following cases where combinations of letters are permitted to represent single phonemes:[1]

a) The affricates [pf], [bv], [ts], [dz], [tʃ], [dʒ], [tɕ], etc.

b) The aspirates [ph], [th], [kh], [tlh], [tʃh], etc. and weak aspirates [pʻ], [tʻ], etc.

c) The aspirated [s] or [sh].

d) [t], [d] with lateral explosions or [tl], [dl].

e) The voiceless nasals, [hm], [hn], [hɲ], [hŋ], when these are distinct phonemes.

f) Retroflex vowels, as American [əɹ], or Peiping [uɹ].

g) Labiovelar consonants as [kp], [gb].

Of these cases, a) and b) are recognizably compound sounds, which we should consider as two or three piece sounds, for which the use of [tʃ], [dʒ], [ph], [th], etc. would be considered as normal and the use of [č], [ǰ], (or [c], [ɟ]), [p], [t], etc. would be considered as cases of under-analysis. c) and d) may be regarded as borderland cases. e), f), and g) are clear cases of over-analysis, that is, cases of one homogeneous sound represented by two or three piece symbols, each of which represent some aspect or aspects of the sound[2]. Thus, [hm] is a [m]-sound which is breathed (i.e. [h]-ized) or a [h]-sound with labio-nasal articulation (i.e. [m]-ized). It is meaningless to ask which is the substantive and which is the adjective, as they are all constituting attributes which together form the sound in question and could be represented by Jespersen's over-analytical analphabetic symbols. Similarly, American [əɹ] is a single vowel formed by the middle of the tongue in the [ə] position with the apex curled back (sometimes transcribed as [ɚ]). The representation of voiceless [w], or [ʍ] by [hw] is another case, which is mentioned by Jones and Camilli under an earlier section in the same pamphlet quoted[3].

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1. *Fondamenti di Grafia Fonetica*, by Daniels Jones and Amerindo Camilli, 1933, Aube and London, pp. 11-12.

2. G. M. Bolling must have overlooked such cases when he says, "At least I can recall no example of......a digraph for a non-compound phoneme," from editorial note on R. G. Kent's review of Bloomfield's *Language* in the journal *Language*, X, 1, 1934, pp. 51-52.

3. *Fondamenti*, p. 11, section 15.

Among the uses of diacritical marks, Jones and Camilli[1] mentions "the saving of a series of new letters," such as adding ˜ to [ɑ], [ɔ], [œ], [ɛ] to form [ɑ̃], [ɔ̃], [œ̃], [ɛ̃] in French. The reader will recall the great furore which was aroused by Passy's proposal to use [ɑŋ], [ɔŋ], [œŋ], [ɛŋ] for these French vowels in the first post-war issues of *le Maître Phonétique*. He modestly called it orthographic transcription, but if [ɔɹ] can represent [ɚ], there is no reason why [ɑŋ] cannot represent [ɑ̃]. To object that other French dialects or German actually has [ɑŋ] as two successive sounds is beside the point, as we are talking about phonemic transcriptions and our universe of discourse is limited to one dialect or one language, otherwise we should have to go back to narrow phonetic transcriptions. Not that [ɑŋ] is the only right way or even a good way of representing French [ɑ̃], but there seems to be nothing wrong, so far as usage in other cases goes, in representing one piece sound by two piece symbols.

Jones and Camilli do another thing along the same line. Without mentioning the saving of a series of modified letters under any of the principles, they also use the device of representing one piece sound by two piece symbols in transcribing the Russian palatalized consonants, where the explanatory note says, "j is used as the sign of palatalization, that is, tj = ţ, nj = ŋ̡, lj = ļ, snj = sŋ̡, tnj = tŋ̡, lnj = lŋ̡, etc."[2] This [j] is therefore a significant feature, but it does not necessarily occupy any time of its own.

Another important case is that of the "voiced *h*", which plays a very important part in the Wu-dialects in China. These dialects usually have an ordinary [h], which has different values according to the vowel following and may therefore be taken as one phoneme, just as in the case of English or German, so that instead of having $2n$ symbols for h_1a_1, h_2a_2, ... h_na_n (where a_1, a_2, ... a_n are the vowels which may follow the h in the language), we need only $n+1$ symbols for ha_1, ha_2, ... ha_n. But in the case of the voiced *h*, not only the vowel quality (or the vowel articulation) begins at the very beginning of the breathing, but the breathiness also lasts till the very last moment of the vowel, so as to form one homogeneous breathy vowel, and there is neither question of order of succession nor question of substantive and adjective. If we must have one piece symbol for one piece sound, we should have to have either a series of different voiced *h* symbols for different vowels, or an extra series of breathy vowels have to be recognized. The only practical thing to do here is to consider voiced *h* as one phoneme and write the vowel

1. *Fondamenti*, p. 4. section 3).
2. *Fondamenti*, p. 17.

signs *after* it, as [ɦɑ], [ɦe], [ɦo], etc., although we know that these digraphs represent perfectly homogeneous sounds.

There are also borderland cases where it is open to question whether certain sound-elements are simultaneous or successive. According to ordinary transcriptions, the English word *sway* is transcribed as [swei] while the Chinese word 歲 is transcribed as [suei], from which it would seem that the first two elements in Chinese 歲 would be separated more clearly than in English *sway*. As a matter of fact, the contrary is the case. While the [s] in English *sway* is not at all labialized for most of its duration, the [s] in Chinese 歲 is completely labialized. Moreover, the diphthong [ei] starts almost as soon as the tongue leaves the [s]-position without leaving any appreciable duration for the [u] or [w] to stand alone, so that a narrow transcription might give 歲 as [s̫ei] or, as the velar element is rather weak in this type of word, as [σei]. But in similar syllables in other tones or with other initial consonants, there is more independence in the [u]-element. It would be contrary to the spirit of phonemic transcription to write 歲 as [σei] and 對 as [tuei]. Consequently, we must allow as a possible phonemic "solution" the over-analysis of [σ] into two phonemes [su] or [sw], and so long as our universe of discourse is Chinese (Mandarin) phonemes, we should not be disturbed by the fact that [sw] in English is a succession of two sounds in which [s] is little or not at all [w]-ized.

From the consideration of these cases of under-analysis and over-analysis, we see the great advantage of Bloomfield's speaking of sound-features instead of sounds. If we consider a sound as made of a number of features, then a phoneme is a combination of certain (simultaneous and/or successive) features, leaving other features unspecified. The English [t]-phoneme, for instance, consists of the features of voicelessness, apico-alveolar articulation of a certain range (*eighth, tea, tray*), and complete stop of breath, while the exact position of articulation, the force of stopping, the nature of on-glides (*heat, hoot*) and off-glides (*tar, star, tea, two, little, button, but*) are left unspecified. The Chinese [u]-phoneme consists of the features of lip-narrowing, a slight velar action, and voice, and as the position of the tip of the tongue is left unspecified, it is perfectly free to form the [s]-articulation while the [u]-articulation is being held, so that we can entertain the idea of two phonemes [s] and [u] being telescoped into one single sound [σ] without necessarily considering the sound [σ] as one new phoneme or as *one* member of a new phoneme. Similarly, the [ɦ]-phoneme in the Wu-dialects consists of the feature of emitting more air than usual in producing voice, and as it does not specify anything about the oral or nasal features of articulation, the speaker is free to do all kinds of

articulatory tricks at the same time with [ɦ][1], so that there is an [ɑ] type of [ɦ], and [ə] type of [ɦ], etc., and even an [m̩] type of [ɦ], as [ɦm̩] ("have not"), as contrasted with [m̩] in [m̩-mɑ] ("mother"), and yet all this does not prevent us from considering the [ɦ] and [ɑ] in [ɦɑ] as two theoretically separate phonemes.

(c) *Zero Symbols*[2].—As limiting cases of the variation of the size of unit, we have the possibility of using zero symbol for sounds or sound-features and of counting absence of sound as a phoneme or as one member of a phoneme.

Where there are several degrees of significant stress, significant length, or kinds of significant intonation, it is the usual practice to represent one of them by zero symbol. Thus, unmarked syllables in polysyllabic English words are understood to have the low degrees of stress. Vowels without length marks are understood to be short. In most systems of tone-marking, the first tone in Chinese is "marked" by not marking it.

In the Chinese syllables [tʂʅ] [tʂʻʅ]. [ʂʅ]. [ʐʅ], [tsɿ], [tsʻɿ] [sɿ][3], there is a vowel which is a vocalized prolongation of the preceding consonant, and is understood to be present when these syllables are written as ㄓ. ㄔ, ㄕ, ㄖ, ㄗ, ㄘ, ㄙ in the National Phonetic Script. This is therefore a way of representing actual sounds by zero symbol.

In German stressed syllables beginning orthographically with a vowel, there is normally a glottal stop. Some writers give the symbol [ʔ] for this sound, but others omit the symbol, and in internal positions as in *verein*, a stress mark suffices to indicate the presence of the [ʔ], as [ferˈain]. It would be perfectly possible, though hardly conventional, for us to favor some other phoneme with the saving of a symbol, say [h], and transcribe *hauch* as [ɑux] and *auch* as [ʔɑux].

Readers of Bloomfield's *Language* who are used to ordinary types of transcriptions of English must have been impressed by forms like these:

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1. There is a trick recitation in one of the dialects near Nanking in the form of a story consisting mostly of phrases like 鵝對鴨 [ŋo tuei ŋɑʔ] ("goose versus duck"), in which a flapped click is made with the front of the tongue each time [ŋ] is pronounced. The effect is that of beating a pair of clapping boards as an independent rhythmic accomaniment to the recitation. In other words, the [ŋ]-phoneme consists of the features of voice, nasality, and articulation with the back of the tongue. The front of the tongue can do as it pleases.

2. Under this heading, we are not including cases like ancient Hebrew, in which the vowels were not written. For in this system of writing, the vowels cannot be deduced from the phonetic environment alone by any set of phonetic rules. The writing is therefore an orthography and not a transcription.

3. The symbols ʅ **and** ɿ are Karlgren's.

gentleman	[ˈǰentḷmṇ]	p. 111
atom	[ˈɛtṃ]	112
maintenance	[ˈmejntṇṇs]	,,
maintain	[mṇˈtejn]	,,
stirring	[ˈstṛiŋ] vs. *string* [striŋ]	121
pattern	[ˈpɛtṛn] vs. *patron* [ˈpejtrṇ]	,,
erring	[ˈṛiŋ] vs. *ring* [riŋ]	122
error	[ˈerṛ]	,,
butter	[ˈbotṛ] on a par with *bottle* [ˈbɑtḷ]	,,
bottom	[ˈbɑtṃ] on a par wi h *button* [ˈbotṇ]	,,
anatomy	[eˈnɛtṃij] vs. *met me* [met mij]	,,

Now Bloomfield systematically avoids the use of the obscure vowel letter [ə] and plays his game admirably well. The *e* in French *le*, he considers as a short variety of [œ] (p. 106), which agrees more or less with the idea of the French themselves. For German, he lets the difference in stress take care of the difference between [e] and [ə]. For American English, he uses the strong forms where there is no following consonant or where the following consonant is not usually considered to be syllable carriers in English, but leaves out the symbol entirely in other cases. Now from the point of view of actual sound, weakened orthographically written vowels either become [ə] or disappear entirely. If we take ordinary deliberate conversation as the style of "language" to consider, we can say, according to the writer's own observation of Middle Western American speech, that the presence or absence of a vocalized [ə] is about as follows:

[ə] *compulsory or preferred.*	[ə] *optional.*	*Absence of* [ə] *compulsory or preferred.*
arbor [–bər] vs. *club rate*	***happen*** **[–p(ə)n]**	*able* [–bḷ]
upper [–pər] vs. *upright*	***often*** **[–f(ə)n]**	*simple* [–pḷ]
gentleman [–mən] vs. *autumnal*	***even*** **[–v(ə)n]**	*dismal* [–mḷ]
humor [–mər] vs. *am ready*	***bacon*** **[–k(ə)n]**	*careful* [–fḷ]
kingdom [–dəm] vs. *bed-mate*	***winkum*** **[–k(ə)m]**	*devil* [–vḷ]
London [–ndən] (cf. *sudden*)	***Beauchamp*** **[–č(ə)m]**	*sudden* [–dṇ]
under [–dər] vs. *shad roe*	***Gresham*** **[–š(ə)m]**	*middle* [–dḷ]
atom [–təm] vs. *met me*	***patron*** **[–tr(ə)n]**	*colonel* [–nḷ]
pattern [–tərn] vs. *outright*	***Durham*** **[–r(ə)m]**	*wiggle* [–gḷ]
maintenance [–nəns] vs. *main news*	***Coral*** **[–r(ə)l]**	*engine* [–ǰṇ]
Barnum [–nəm] vs. *on me*	***handsome*** **[–s(ə)m]**	*cordial* [–ǰḷ]
corner [–nər] vs. *Henry*	***bosom*** **[–z(ə)m]**	*luncheon* [–čṇ]
Helen [–lən] vs. *hell no*	***Bentham*** **[–θ(ə)m]**	*celestial* [–čḷ]

[ə] *compulsory or preferred.*	[ə] *optional.*	*Absence of* [ə] *compulsory or preferred.*
alum [–ləm] vs. *elm* (though [ˈeləm] in some Am. dialects)	*fathom* [–ð(ə)m]	*nation* [–šn̩]
Keller [–lər] vs. *all right*	*lengthen* [–θ(ə)n]	*special* [–šl̩]
finger [–gər] vs. *big row*	*heathen* [–ð(ə)n]	*vision* [–žn̩]
poker [–kər] vs. *quick ride*		*listen* [–sn̩]
singer [–ŋər] vs. *sing right*		*tassle* [–sl̩]
ginger [–ǰər] vs. *age wrong*		*dozen* [–zn̩]
teacher [–čər] vs. *teach right*		*hazel* [–zl̩]
pleasure [–žər]		*ethel* [–θl̩]
error [–rər] vs. *her right*		*brothel* [–ðl̩]
tracer [–sər] vs. *viceroy*		
Caesar [–zər] vs. *phase-rule*		
ether [–θər] vs. *Ruth ran*		
father [–ðər] vs. *with red*		

Opinions may differ as to the placing of particular cases under each heading, but there seems to be no doubt as to the presence of [ə] in *gentleman* [–mən] or as to the absence of [ə] in *able* [–bl̩]. Historically, as the orthography indicates, many of these words had clear vowels. Now some of them have an obscure vowel even in deliberate speech, which does not however entirely disappear in some cases. Since the presence, option, or absence of the [ə]-sound are more or less determined by the nature of the sounds preceding and following, and sometimes by conditions of syllabication, we can regard this as one phoneme of which one member is the obscure vowel [ə], a second member is a variphone (or dynamophone) consisting of [ə] and zero, and a third member is zero. Bloomfield has therefore as much right to represent this phoneme by zero symbol as one has to represent German [ʔ] by zero symbol. Apparent ambiguities as in the case of *string* and *stirring*, may be avoided by marking the syllabication [ˈstr̩iŋ], which will remind us to explode the [t] before the [r̩], as it is a case of the first member of the phoneme.

It should be noted that our discussion here is to find a methodological justification for Bloomfield's use of zero symbol for an actual sound. There are other considerations from which this avoidance of the symbol [ə] seems rather inconvenient. Thus, when there is no final consonant like [l], [n], etc., to act as a syllable carrier, as in Americ*a*, s*u*ppose, jeal*ous*, he is obliged to use exclusively strong forms like [eˈmerike] or [ɛˈmerika], [soˈpouz], [ˈǰelos], which are rarely heard even in deliberate speech (understanding of course that [o] is the "short *u*"). The definite

article *the* will have to be either [ðij] or [ð], with no middle ground. Those who favor Bloomfield's system for English will find that he is simply carrying the omission of [ə] to its logical conclusion. Those who do not will consider forms like [ˈstriŋ], [ˈmejtn̩n̩s], [eˈmerika] a *reductio ad absurdum*.

Under cases of under-analysis, we considered the representation of affricates, aspirates, and narrow-range diphthongs by single symbols. Now if the symbol used is obviously *one* of the elements in the compounds, as [p] for [pʻ], [c] (instead of [č]) for [cç], [ɟ] (instead of [ǰ]) for [ɟʑ], or [o] for [ou], then we can regard that element which is understood but not represented as having zero symbol. For instance, in the Soochow dialect, labials go with [ʉ], velars and dentals go with [əu], and alveolars go with an apical vowel with protruding lips, for which the writer has proposed the symbol [ʮ][1], as 布 [pʉ], 故 [kəu], 註 [tʂʮ]. All these can be considered as members of one phoneme [u], in which case the [ə] in [əu] would be a sound with zero symbol. Again, in the Foochow vowels [u]: [ou], [i]: [ei], [y]: [øy] according to tone, as cited above, it is common practice to consider the first tone, which goes with [i], [u], [y], as more primary or representative, and for certain reasons, it may be more convenient to write these phonemes as [i], [u], [y], in which case a tone mark would suffice to remind one of the addition of [e-], [o-], [ø-] (by no means weak and parasitic), though these elements still have no symbol to themselves except as implied by the tone.

(d) *Zero Sound.*—In the cases of over-analysis, as in [ɦɑ], we had two features representing separate phonemes which together make one single sound. But if we take the series [ʉ], [əu], [ʮ] in Soochow and consider them as varieties of [əu], of which the [ə] is absent after labials and alveolars, then under the latter conditions, the phoneme [ə] will have zero as a member. Similarly, if we write in the symbol [ə] for *maintenance* [-nəns], *happen* [-pən], *button* [-tən], all alike, then the [ə] will be a symbol for a phoneme, of which one member (in words of the type in the third column in the preceding table) has the value zero. Again, Bloomfield's use of [ij] and [ow] in unstressed positions may be regarded as cases of [j] and [w] with zero sound. In Passy's "orthographic" notation referred to above, he spelt out the "mute *e*" as [ə] in all cases, letting the "rule of three consonants" take care of the presence or absence of the actual sound. From our point of view, [ə] would then be a phoneme with zero as a possible member. In the system of ancient Chinese initials, there are two called *yiing* (影) and *yuh* (喻) which have been reconstructed by Karlgren as [ʔ] and smooth vowel

1. A combination of Karlgren's [ʅ] and [ʯ].

respectively. Those are of course only the *names* of the initials. But Jang Tayyan (章太炎) has devised an *alphabet* with a symbol for each of the 36 initials, so that his symbol for *yuh* would be a symbol with zero value, very much like the "ʼ"-symbol for the smooth ingress of vowels in Greek.

In the theory of *sheh* (攝) or "rim-emes" in traditional Chinese phonolgy, the use of a symbol for zero is extremely useful. Taking again the National Phonetic Script, which is constructed very much in the spirit of traditional phonology, we have the rimemes ㄟ, ㄡ, ㄣ. ㄥ. which, like the other rimemes, may be preceded by the medials ㄧ, ㄨ, or ㄩ, so as to form the following complete finals (i.e. syllables minus initial consonant, if any) which actually occur in words:

Without medial :	ㄟ	ㄡ	ㄣ	ㄥ
with medial ㄧ :		ㄧㄡ	ㄧㄣ	ㄧㄥ
with medial ㄨ :	ㄨㄟ		ㄨㄣ	ㄨㄥ
With medial ㄩ :			ㄩㄣ	ㄩㄥ

A simple phonemic transcription in the IPA would be:

əi	əu	ən	əŋ
	iəu	iən	iəŋ
uəi		uən	uəŋ
		yən	yəŋ

In these twelve finals, the [ə] in [iən], [iəŋ], and [yəŋ] always has zero value (in [yəŋ], [y] is broken up into an intermediate value between [iu] and [yu]), just like the [e] in [ba:den] for German *baden*[1]. In the case of [uəi] and [iəu], the [ə] has zero sound in the first and second tones and has some sound in the third and fourth tones, except that in [uəi] not preceded by an initial consonant, [ə] does not entirely disappear in any tone. In [uən], the [ə] has zero sound in the first and second tones when there is an initial consonant, is fully sounded when there is no initial, and is very weak in other cases. With [uəŋ], the [ə] is sounded only when there is no initial consonant. With [yən], the [ə] is sounded (with a value [ι]) when there is a palatal initial or no initial, but has zero sound with other initials. With such a complicated group of facts, where each case is a law unto itself, we should still fail to attain perfect phonetic accuracy by writing something like:

ei	ou	ən	ʌŋ
	iu	in	iŋ
uei		un	uŋ
		yn	iuŋ,

1. Bloomfield, *Language*, p. 113.

although this may be a useful form of transcription for certain purposes. The paradoxical appearance of a symbol with widely different values, including zero, would disappear if we stuck to the National Phonetic Script or used some non-committal symbol as "ɸ" for the phoneme in question, thus:

ɸi	ɸu	ɸn	ɸŋ
	iɸu	iɸn	iɸŋ
uɸi		uɸn	uɸŋ
		yɸn.	yɸŋ.

This is of course not the only or even the best phonemic treatment of these finals, but by allowing the possibility of zero members of phonemes, we do gain a number of advantages.[1]

(e) *Phonemic Treatment of Conditional End-consonants.*—In ordinary transcription of French, cases of liaison and elision are spelt as they sound. The word *pas* then has two forms [pɑ] and [pɑz], *le* has [lə] and [l], and by the "rule of three consonants," the word *demander* has the two forms (vous) [dmɑ̃de] and (pour) [dəmɑ̃de]. Similarly, Southern English *sore* has the two forms [sɔː][2] (throat) and [sɔːr] (eyes). The presence or absence of the sound in question is not distinctive, so that it and zero may be considered as members of the same phoneme. But the difference between *saw* [sɔː] and *sore* [sɔː] *is* distinctive, and for the phoneme with the conditional [r], the symbol "*" has been used in dictionaries, though the writer has never seen it used in texts, probably because ordinary transcriptions are not phonemic. From arguments with unsophisticated Frenchmen, who insisted that *point* did not have the same pronunciation as *poing*, the writer would think that a special phonemic symbol for these optional sounds would be welcomed by the French, say something like [pɑ*z*], [pwɛ̃*t*], so as to avoid the pitfalls of the "[pɑtakɛs]" business[3]. Better symbols than these may be devised. Our interest here is in the obvious phonemic nature of these groups [z] : zero, [t] : zero, etc. It may not be necessary to outlaw the writing of two alternate forms for one word. But it would be an advantage not to have to do so.[4]

1. In this article, we are limiting ourselves to the discussion of phonemes of single languages. If we extend our universe of discourse to diaphones, say about 100 miles south of Peiping, the advantage of the above form will be enormously increased.

2. One type of Southern English.

3. "Puisque ce n'est pat à moi et n'est poins à vous, je ne sais pat à qu'est-ce." From Passy's *Chresthomathie*.

4. The case of English *a: an* is somewhat doubtful. If English never had a system of writing, or if its orthorgraphy had come to writing *for uncle: fo mother*, just like *an uncle: a mother*, we might then be inclined to treat the indefinite article as one word (as it was) and provide a special phoneme [-*n*] as its second element, a phoneme which occurs only in one word. Cf. II(e) below on word identity.

In this connection, we may mention the so-called "aspirated *h*" in French as a consonant phoneme which always has zero sound, but has a very definite "feature" of its own, and may be conveniently symbolized as [*h*]. The great advantage in regarding this as a consonant phoneme lies in that it greatly simplifies the description of the behavior of other phonemes. We can then say that [-t] (liaison *t*) has the sound [t] before vowels, and zero sound before consonants or in end-position. If we refuse existential status to [*h*], we should have to say that [-t] has the sound [t] before vowels, except before the following exhaustive list of words: [aza:r] [õ·z], etc., etc., which is no way of stating the "rule of pronunciation" for phonemes.

In many Chinese dialects, final consonants like [-n], [-k], [-ʔ] are pronounced very clearly at the end of phrases, but become weakened or disappear entirely when followed immediately by another word. The [-ʔ] in Foochow or the Wu-dialects is a phoneme which has zero value before another word. Thus, Soochow 八 [poʔ] "eight," 八百 [popɑʔ] "eight hundred," 八百八 [popɑpoʔ], "eight hundred eight(y)." The vowel is not even lengthened (as it is in Foochow under certain conditions) to make up for the time of the original [ʔ]. If we write phonemically, we can represent this phoneme with [ʔ] and zero sound as its two members either by (1) zero symbol (and let the symbol for the entering tone, with which it is always associated in these dialects, indicate its presence), or (2) the symbol [-ʔ] or [-ʔ] in all cases, whether the glottal stop is articulated or not.

It is not our purpose here to propose purely for the pleasure of perversity either to under-analyze two or more piece sounds and treat them as single phonemes or to over-analyze one piece sounds and treat them as successions of phonemes; nor purposely to write something where there is nothing to write or to write nothing where there is something to write. We wish only to indicate that all such tricks are actually being done in current transcriptions, and that according to the way in which we treat the time unit of phonemes in a language, we may arrive at one or another of various possible solutions for that language.

2. The Grouping of Sounds into Phonemes.—

So long as we confine ourselves to the consideration of stock examples like *keep*, *call*, *cool*, our construction of phonemic systems is smooth-sailing. We need only to disregard slight variations of what is generally regarded as "the same sound" and call it a phoneme. But on many questions of the identification of sounds in a language, we are not favored with such general concensus of opinion. Is the second element of the English "long *i*" to be identified with the first element in *yes* (Bloomfield's [aj]), or with the first element in *it* ([aɪ] by many

writers), or with the final element in *very* (Palmer's [aɪ]), or with the undistinguished [i] in *it* [it], *eat* [i:t], *very* [ˈveri] ([ai] by many writers), or with the first element in *eight* ([ae] in certain "narrow" transcriptions)? Is the palatal series [tɕ], [tɕʻ], [ɕ] in words like 家, 斉, 下 (occurring only before high front vowels) to be identified with the velar series [k], [kʻ], [x] or with the retroflex series [tʂ], [tʂʻ], [ʂ] (none of either series ever occurring before high front vowels)? According as we emphasize this or that motive, we should arrive at a different system of organization of elements into phonemes. We may desire to have (a) phonetic accuracy, or smallness of range of phonemes, (b) simplicity or symmetry of phonetic pattern for the whole language, (c) parsimony in the total number of phonemes, (d) regard for the feeling of the native speaker, (e) regard for etymology, (f) mutual exclusiveness between phonemes, (g) symbolic reversibility, and these motives are often conflicting.

(a) *A minimum degree of phonetic accuracy* is provided for by the "similar in character" clause contained in Jones's later definition. By our purely logical definition, we should have the possibility of regarding English [h] and [ŋ] as members of one phoneme, which never occur in the same phonetic environment, and we could write forms like [ɧæt], [biˈɧeiv], [sɔɧ], [ˈsiɧə*] for *hat, behave, song, singer*, and learn very quickly when to say [h] and when to say [ŋ]. Such practice, however, would not be favored by either the phonetician or the philologist. Now the automaticity of variation within a phoneme has two senses. (1) The variation of [h] of the shades [h_e], [h_a], [$h_ə$], [h_o][1], etc. according to the following vowel is automatic practically in all languages which have these sounds. So is the variation of the [t] in [ts] and [tʃ] in all languages which have these affricates, that is, if we take affricates as successions of two phonemes. But such cases are much rarer than we are inclined to think. (2) In most cases, the automaticity of variation holds only for the particular language in question, although familiarity with the language may give one the impression of its universality. Thus, speakers of one language, e.g., Japanese, would find the change of [h] into [ç] before [i] so natural as to be something inherent in the nature of speech sounds, while in another language, e.g., German, [h] can be followed by [i] without becoming [ç], which belongs to another phoneme. The variation of Foochow [a] and [ɛ] 能, "to be able to," according to tonal environment is so natural to the native speaker, that he refuses to admit that he is not pronouncing it always in one and the same way, while in many languages these are widely different phonemes. Since,

1. Not to include cases of high vowels, which involve other questions.

therefore, the automaticity of variation is mostly of conditional nature, we shall have to allow a good deal of latitude in the interpretation of the "similar in character" clause. For the sake of phonetic accuracy, it would be an advantage to construct our phonemes with as narrow ranges of variation as possible (though it is never desirable to limit ourselves to universally automatic groups of the type (1) mentioned above), but this one desideratum may have to be sacrificed to some extent for other motives.

(b) *Simplicity or symmetry of phonetic pattern* is a factor which greatly influences our organization of phonemes. Bloomfield wishes to say that there are no long vowels in English, a statement which, from our standpoint, is neither true or false, but may be estimated as methodologically desirable or not desirable. He has eight vowels:

i	u
e	o
ɛ	ɔ
a	ɑ

and eight diphthongs or triphthong:

aj	ɔj[1]	ej	ij	juw
aw	ow		uw	

It would seem that he could gain phonetic accuracy by writing [ai], [ɔi], [ou], even without the addition of special symbols like [ɪ] and [ʊ], but then he could not very well go on and write [ii], [uu], and if he indicated the diphthongal character of these vowels by [ij], [uw], the system would look much less symmetrical. The table would also look less symmetrical if he wrote [iː] [uː], with the American narrow-range [eː] and [oː] lurking around for recognition, while [aj], [aw], and [ɔj] must still remain as diphthongs. The use of the nonce phoneme "ɵ" for Chinese (see I (d) above) with zero as a possible member of the phoneme, gives great symmetry to the system. Again, the series ㄢ, ㄧㄢ, ㄨㄢ, ㄩㄢ may be symmetrically rendered as [an], [ian], [uan], [yan] instead of the usual [an], [iɛn][2], [uan], [yan], which is phonetically more accurate, but by no means necessary. When symmetry runs parallel to structural or etymological considerations, so that the phonemes also agree with diaphones or phonogenes, its claim for consideration will of course be greatly increased.

1. Regard for "similarity in character" probably prompted him to identify the first element of *oil* with the first element in *or*, rather than the first element in *up*. He would gain still more symmetry if he wrote [oj], [ow], or still better [ɔj], [ɔw], as the first element in *own* is much nearer the first element in *or* [ɔr] than the first element in *up* [op] in American English.

2. Considering ㄧㄢ as the nasal ending counterpart of ㄧㄝ [iɛ].

(c) *Parsimony of entities* in the spirit of "Occam's razor" is of course the hobby of symbolologists. We already noted the admission of digraphs for single sounds for the saving of a whole series of new letters. The use of [ij] and [uw] or introduction of a symbol for length saves the use of the letters [ɪ], [ʊ], and [ɒ] for English. Palmer deplores this "exaggerated compliance with the principle of symbol economy,"[1] because, among other reasons, the symbol for length, e.g. in *although* [ɔːlˈðou] does not necessarily indicate length. The writer can recognize the usefulness of the letters [ɪ], [ʊ], and [ɒ] from motives of phonetic accuracy, but the objection to the length mark does not seem to be fatal, for the symbol [ɔː] may also be taken phonemically in such a way that it is long in stressed positions, less long before voiceless consonants, and short (without change of quality) in unstressed positions, while [ɒ] can still be considered as a separate phoneme. Bloomfield's avoidance of [ə] and his identification of the vowel in *son* with the first vowel in *own* (instead of writing the former [ʌ] or [ɤ]) also effects a saving of "queer symbols."

The extent to which one could go in the parsimony of symbols can best be illustrated by Liu Fu's numerical code for the Peiping syllables.[2] He used only six symbols in six positions (or *plus* six positions, if we count positions as part of the symbols) as follows:

Position / Figure	I. HEAD: *Place of articulation*	II. FACE: *Manner of articulation*	III. NECK: *"Medial"*	IV. ABDOMEN: *Principal vowel*	V. TAIL: *Final vowel or consonant*	VI. EXPRESSION: *Tone*
0	zero		zero	zero	zero	—
1	labial	unaspirated	i	ə	i	1st
2	dental	aspirated	u	ɑ	u	2nd
3	velar or palatal	nasal	y		n	3rd
4	retroflex	voiceless continuant			ŋ	4th
5	dental advanced	voiced continuant				

Thus, 光 [kuɑŋ] would be 312241, where 31 stands for [k], 224 is [uɑŋ] and the last figure 1 means the first tone. 000042 would be the nasal interjection meaning "What did you say?" This system is extremely symmetrical in structure, economical in the number of *kinds* of symbols used, and very illuminating as to the phonetic pattern of the language,

1. H. E. Palmer, *Principles of Romanization*, pp. 68-69.

2. "A Table of the Analytical Numbers of the Beeipyng Dialect," *The Kwoshyue Jihkan*, III, 3, 1932, pp. 533 ff.

but it can hardly be used as a system of transcription and was never intended to be. It may noted here that his "Abdomen No. 1" includes [ɤ], [ʌ] [ɛ], [ɔ], [ɪ], [ə], and zero as members, and corresponds to our "ɵ". In the body of the table, he gave also a somewhat narrow transcription of all the syllables.

(d) *The feeling of the native speaker* is a factor which is greatly emphasized by Sapir. Where the feeling comes from obvious misconceptions, arising often from orthographic considerations, such as the idea that *principal* and *principle* have different pronunciations[1], or that $ng=n+g$[2], we need not take it very seriously. But when there is no question of misconception, but one of preference of choice between alternate manners of organization of phonemes, then the feeling of the native should be given due consideration, though it need not be taken as the deciding factor. Thus, while the phonetician would write Chinese ㄢ, ㄧㄢ, ㄨㄢ, ㄩㄢ as [an], [iɛn], [uan], [yan], the speaker of the dialect of Peiping feels that they all belong to the same rimeme with different medials. This is further supported by the fact that when the [-n] is dropped when the syllable is amalgamated with a following retroflex vowel, [ˈiɛn] does not became [iɛr], but [iar], as in 一點兒 [i tiɛn ər] > [itiar], "a little." The speaker of the Foochow dialect feels that among the vowels in the following words,

音	iŋ˥	詠	ɵiŋ˧˥˧
鶯	eiŋ˥	限	aiŋ˧˥˧
溫	uŋ˥	問	ouŋ˧˥˧
恩	ouŋ˥	梡	ɔuŋ˧˥˧

those in the same *row* are tonal variations of the same vowel, while refusing to recognize that the vowels in 詠 [ɵiŋ] and 鶯 [eiŋ] or those in 問 [ouŋ] and 恩 [ouŋ] are the same. As there are very definite rules for the diphthongization of single vowels (or opening of close vowels, as [ɛ] : [a]), it is quite possible to arrange the Foochow vowel phonemes according to the native conception as an alternate and for some reasons a better way of grouping the phonemes. On the ambiguity of the phonemic membership of Peiping ㄐ, ㄑ, ㄒ, the native speaker will also have something to say. The distribution or patterning of these sounds and related sounds are as follows:

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1. Except when the former is pronounced [prinsiˈpæl], which is merely an abbreviated way of saying "the word which ends in *-p-a-l*."

2. Even this is open to question, if we take a broader linguistic (as contrasted with phonetic or phonemic) point of view. Cf. Sapir's discussion on this point in "Sound Patterns in Language," *Lauguage*, I 2 (1925), p. 49.

(1)	ㄐ ㄑ ㄒ	tɕ	tɕʻ	ɕ	always before [i] or [y]
(2)	ㄍ ㄎ ㄏ	k	kʻ	x	never before [i] or [y]
(3)	ㄗ ㄘ ㄙ	ts	tsʻ	s	
(4)	ㄓ ㄔ ㄕ	tʂ	tʂʻ	ʂ	

It is therefore possible to identify the series (1) phonemically with any one of the other three series. Wade identifies it *partially* with (4): he writes *ch, ch, hs* for (1), and *ch, ch, sh* for (4). The National Romanization identifies (1) with (4) completely by writing *j, ch, sh* for both. The French system of romanization for Chinese has (2) or (3) according to etymology, which was what (1) came from, and over-zealous adopters of the French system identify (1) with (3) completely, and write forms like *Sien Sien* for 獻縣, although both belonged to series (2). Now as to the feeling of the native, the favoured series is (2). For he feels [kə, tɕi, ku, tɕy] or [xə, ɕi, xu, ɕy] to be alliterative series with only different vowels. Moreover, in the system of a secret language which breaks every syllable with initial-final *I+F* into *I*ai+k*F*, (e.g. 北 [pei]: [pai-kei])[1], the [k] becomes [tɕ] when the final begins with a high front vowel, as 米 [mi]: [mei-tɕi].

(e) *Regard for etymology* is properly not within the scope of our present study, which is concerned only with the descriptive study of one language of one period. But in the very frequent case of possibility of alternate phonemic treatment, we should certainly be allowed to steal a squint towards extrinsic factors. As a matter of fact, consideration of etymology does have a great weight with many writers. The identification of [tɕ], [ɕʻ],[ɕ] with [k], [kʻ], [x] is etymologically preferable, if only partially, to identifying them with [tʂ], [tʂʻ], [ʂ]. It would, however, cease to be strictly phonemic transcription of the Peiping dialect if we split [tɕ], [tɕʻ], [ɕ] into a velar and a dental series according to derivation, as [xi] for 希 and [si] for 西, for then no rule of phonemic membership short of lexical enumeration could tell us when it is [xi] and when it is [si].

It is also of etymological interest to try to secure identity of words by giving them constant phonemic forms. Thus, we can write [sɜː*] or [sɜː*r*] for *sir* and let the phonetic environment decide when it is to be pronounced [sɜːr], [sɜː], [sər], or [sə]. Again, by writing [ɛːtrə] for *être*, instead of [ɛːtr] before vowels, [ɛːtrə] before consonants, and [ːɛtr̥] at the end of phrases, Passy gives the word a constant form, the value of the phoneme [ə], which may be written in italics if desired, to be determined by the "rule of three consonants," etc. The Foochow

1. Y. R. Chao, "Eight Varieties of Secret Language," Based on the Principle of Fanch'ieh, This *Bulletin*, II, No. 3, 1931, pp. 320 ff.

word 能 "to be able to," may be given the constant form [a], or a compromise form [æ], and the choice of values between [ɛ] and [a] may be determined by a very simple tonal rule. The identity-of-word interest, however, must not go so far as to cover grammatical considerations, where the rule of pronunciation would have to contain other than purely phonetic conditions. Thus, while we can write French *en* as [a*n*], understanding that it is to be pronounced [ɑ̃] before consonants (*s'en va*) and [an] before vowels (*s'an aller*), we cannot write *fin* as [fi*n*] in order to provide for the pronunciation of the feminine form [fin]. In such cases, we shall have to consider *fin* [fɛ̃] (or [fɛ*n*]) and *fine* [fin] as two separate words, as much as *fils* and *fille*.[1]

(f) *Mutual exclusiveness between phonemes* is another desideratum we wish to consider, that is, the list of phonemes shall not only be exhaustive for the language, but other things being equal, we should try to make the membership of the classes mutually exclusive. Other things, however, are never equal, and we have in fact already allowed the possibility of over-lapping of membership between phonemes in cases like the Foochow:

one phoneme	i	ei
another phoneme	ei	ai
one phoneme	u	ou
another phoneme	ou	u,

and in cases of different phonemes each of which containing zero as a member. The treatment of affricates as independent phonemes where their occlusive and fricative element can easily be identified with other phonemes in the same language, such as Bloomfield's [ǰ] and [č] for what many other writers give as [dʒ] and [tʃ], may also be considered as a case of overlapping of membership. Palmer calls this "multiple identity,"[2] under which he cites a number of examples from Japanese and English. We should note, however, that "the same sound" which belongs to two or more phonemes may be taken in two senses. In a conditional sense, "the same sound" never occurs under the same conditions as to contiguous sounds or as to conditions of stress, length, and intonation. The [ei] in the Foochow [i]:[ei] phoneme occurs always in the tones [˨˧], [˧˥˧], [˨˦], while the [ei] in the [ei]:[ai] phoneme occurs always in the tones [˥], [˥˧], [˧], [˦].[3] The English [č] and [ǰ] also occurs under different

1. Cf. Bloomfield's distinction between *phonetic alternation* and *formal alternation*, "A Set of Postulates for the Science of Language," (the journal) *Language*, II, 3, 1926, p. 160.

2. *The Principles of Romanization*, p. 151.

3. A pure phonetician would therefore urefer to take [ei] as one phoneme (or succession of two phonemes) in seven tones, although this would be against the "feeling of the native."

conditions of stress from combinations like *heat sheets* and *and Jeanne.* In an absolute sense, two phonemes will have in common one member identical in all respects. Thus, there is absolutely no difference between the initial in 希 [ɕi] and the initial in 西 [ɕi], discussed above under (e). We could, if we liked, put both into the [x] phoneme or both under the [s] phoneme, but if we write 希 [xi] and 西 [si], then the identical [ɕ] would belong to two phonemes under the same conditions. This treatment brings up the question of.

(g) *Symbolic Reversibility.* The use of symbols has two aspects, the aspect of reading, or the determination of the object from the given symbol, and the aspect of writing, or the determination of the symbol from the object. The reading aspect of phonemic symbols is always determinate with respect to the language in question. Given a phonemic symbol, the range of sounds is determined, and the choice within the range is usually further determined by phonetic conditions. It would also be a desirable thing to make this reversible, so as to include the aspect of writing, that is, given any sound in the language, its phonemic symbol is also determined. If phonemes do not overlap, this is obvious. If they overlap, and the common members occur under different phonetic conditions, the reversibility still obtains. For instance, although 電報 is normally pronounced [tiɛmpɑu], so that the *m* sounds exactly like the *m* in 門 [mən], yet we can tell that it is only a member of the phoneme *n*, as the phoneme *m* never occurs in this position in standard Chinese. Again, in the dialect of Foochow, if we had symbol *A* for the [i]:[ei] phoneme and symbol *B* for the [ei]:[ai] phoneme, we could still tell whether a given case of the sound [ei] is to be written *A* or *B* according to the tone.[1] But if the identity of a common member between phonemes is unconditional, as the distinction of 希 [xi] and 西 [si] for the Peiping dialect, then it would be impossible to go from the sound to the symbol even for the native speaker. Strictly, a non-reversible symbolization of sounds based on etymological or other considerations becomes an orthography and ceases to be a transcription, and the French system of romanization of Chinese, which distinguishes 基, 欺, 希 *ki, k'i, hi* from 躋, 妻, 西 *tsi, ts'i, si* (also favored by Bernhard Karlgren) is a case of this kind. In other words, homonyms should not have different transcriptions. There is, however, a class of intermediate cases, where the common member between two phonemes occurs sometimes under exactly the same phonetic conditions, but at other times becomes differentiated in some way under other sets of identical conditions. Thus, the same [ə] which occurs in *mica* [ˈmaikə]

1. This is not as complicated as the description looks on paper. The native speaker is not even aware of the vocalic identity or similarity of the [ei] in the two sets of tones.

and in *poker* [ˈpoukə] before consonants become differentiated into [ə] and [ər] respectively before vowels. If we write the former as [ə] and the latter as[ə*] or as [ər], then it will be possible to go from sound to symbol only when the sound in question is followed by a vowel, but not when followed by a consonant. The reversibility is therefore only partial. Usage is by no means uniform in such cases. Sometimes, symbolic reversibility is secured at the expense of word identity, the same word *poker* appearing in two forms [ˈpoukə] and [ˈpoukər], considered as different sets of phonemes. At other times, identity of word form is secured at the expense of reversibility, the same word Fr. *espece* always appearing as [ɛːpɛs], where the final [s] is pronounced [z] when followed by a voiced consonant, so that given the final sound [z], one cannot tell whether it is a member of the [s]-phoneme or a member of the [z]-phoneme.

3. Choice of Symbols.—

It is one problem to group the sounds of a language into such and such phonemes and another thing to assign such and such symbols or letters to these phonemes. As a phonemic transcription has reference to one language, there is a great degree of freedom in our use of symbols. The freedom, however, is not so unlimited as in the case of mathematics, where the same symbol changes value not only from problem to problem, but also within the same problem. From purely logical considerations, it would seem that once the phonemes themselves are agreed upon, it is only a "matter of form" as to the symbols used for them, "What's in a letter?" Who ever heard of one mathematician writing *l, m, n* and another insisting that the same items shall be written as *p, q, r?* In phonetic symbols, however, there is a certain tradition, or rather, what is more unfortunate, a number of conflicting traditions in the use of symbols. Consequently, there arise frequent controversies with as much vehemence as about the use of words. We shall feel the importance of the use of symbols when we realize that it often has an influence on our actual organization of phonemes. Some of the factors which influence our choice of symbols run parallel to those which influence the organization of phonemes. Thus, symmetry and simplicity of phonetic pattern corresponds to a certain degree of symmetry and simplicity in the symbols. Parsimony in the number of phonemes implies also parsimony in the number of symbols. The feeling of the native as to sound will also apply to the choice of the symbol if the language already has an alphabet, although this is often less dependable than his feeling for the pattern in the abstract. In addition to these, we have the following questions specially concerned with the choice of symbols.

(a) *The desire to keep within the limits of the ordinary 26 letters of the roman alphabet* is such a powerful one that transcribers yield to it at great cost to other considerations. Thus, if a language has [ɑ], [ɔ], or [ɛ] but no [a], [o], or [e], then the latter symbols will be used as a rule.[1] If a language has only [ʀ], but no [r], then [r] would be used, although phonetically it would be taking as much liberty as writing [n] for [ɴ]. Bloomfield's use of [o] in the phoneme [o] and the diphthong [ow] avowedly comes from the desire to avoid "queer symbols." So far as parsimony of number of phonemes and symbols is concerned, [ɤ] would do just as well as [o], but would be even more appropriate, as it is more natural to say that the [ɤ]-phoneme is rounded in the diphthong [ɤw] on account of the labial [w], than to say that the vowel [o] in American English is an unrounded vowel except in the diphthong [ow]. This avoidance of queer letters means that while theoretical phonetics tells us that there are such and such sounds, or at least advises us to recognize conveniently such and such distinguishable sounds in the main, yet we feel inclined to identify the phonemes of a language with those sounds which happen to be favored with "lower case" letters.

(b) *Of those symbols which are not the ordinary letters of the alphabet, some are considered less "queer" than others*, either on account of old standing or on account of the importance of their position in the scheme of general phonetics. Thus, [ŋ], [ʃ], [ð] [ø], [ɔ] are usually considered much less queer, and less effort is usually made in avoiding them than in the case of symbols like [ʂ], [β], [ɯ], [ɤ]. Again, in the abstract scheme of cardinal vowels, a special symbol for the part between [ɛ] and [a] would be of less importance than the eight main positions. And since it is possible to group all the [e]-[ɛ] region sounds in English under the phoneme [e], the symbol [ɛ] is thus left free for indicating the phoneme between cardinal [ɛ] and [a], which is what Bloomfield does: using the less queer symbol [ɛ] instead of the symbol [æ], which is "queer" in that it occupies a less strategic position.

(c) *The scale of division* into which a variable range of sounds is supposed to be divided will have a great influence on the choice of the symbols. Thus, the traditional triangular scale

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i       u
  e   o
    a
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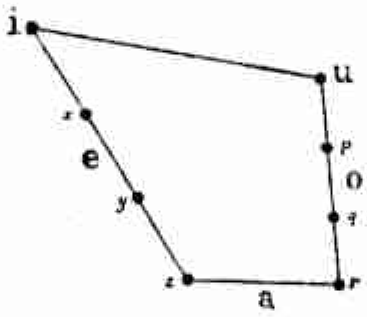
1. Jones and Camilli, *Fondamenti*, p. 3.

and the cardinal scale

i u
e o
ε ɔ
a ɑ

differ in the number of intervals into which the vowels are divided. The difference would be less confusing if we had non-conflicting symbols in the new scale, something like:



As a matter of fact, one does have a partiality for using [e] for [ε] and [o] for [ɔ] (Cf. (a) above), and, less frequently, [a] for [ɑ], which shows the influence of prestige of the i-e-a-o-u system. Every transcriber feels that somehow [ε] is a variety of [e] and not a variety of [a], [ɔ] is a variety of [o] and not a variety of [ɑ]. If we took our scheme of cardinal vowels seriously, we ought not to have such feelings.[1]

In Karlgren's scheme of vowels, using Lundell's dialect alphabet, the 3-point 2-interval high vowel scale of [i (y)-ɨ (ʉ)-ɯ (u)] of the IPA is given as a 2-point 1-interval scale of *l* (*y*)-*ɯ* (*u*). (More accurately speaking, *ɯ* is placed by Karlgren a little to the front of *u*.)[2] The Russian ы, which on the 3-point scale is nearest to [ɨ], is therefore given as [ɨ] in the IPA[3], but as *ɯ* by Karlgren, as it is nearer to the back vowel than the front *i* on his 2-point scale.

(d) *The avoidance of diacritical marks*, which are now reserved for modifiers, also influences our choice of letters. We already noted that rather than writing [s̫] for the single sound in Chinese 歲, we allowed the modifier to be written separately, thus: [suei]. Again, if a language has only two series of voiceless plosives, one unaspirated and one aspirated, but no voiced plosives, then either [p, t, k; ph, th, kh] or [b, d, ɡ; p, t, k] would be preferable to [p, t, k; p‘, t‘, k‘] or [b̥, d̥ g̊; p, t, k].

1. The writer once heard a piece of music and interpreted it as being here in major and there in minor and its notes as being *do*, *re*, *mi*, etc., only slightly "off," but subsequently learned to his surprize that it was a scale of seven equal steps in the octave. The illusion persisted even after it was told. He had forced his own intervals *into* the new scale, just as we all tend to force the 4-step *i-e-a-o-u* scale into the 7-step cardinal scale.

2. Bernhard Karlgren, *Études sur la Phonologie Chinoise*, p. 316.

3. As for instance by Daniel Jones.

(e) *Consistency with phonemic transcriptions of other languages* is a thing that one may keep in mind, but which one must not go out of one's way to obtain. Where our phonemes are of narrow ranges and the symbols given them are the nearest phonetic letter we happen to have, the resulting transcription is not likely to conflict seriously with other transcriptions. But if for one reason or other, our phonemes vary within very wide ranges, and if, further, we wish to secure certain symbolic advantages by departing somewhat from the usual range of values of the letters, then the chance of conflict with other transcriptions will be greater.

III. PHONETIC AND PHONEMIC TRANSCRIPTIONS.

It is usual practice to distinguish between phonetic, or narrow, transcriptions and phonemic, or broad, transcriptions. The former express the actual sounds, [ɹaɪt], [tɹ̥aɪ], [ˈvęrɪ], [eɪt], [gęt], [ðɛə], [æt,] while the latter only indicate the distinctive classes of sounds, [rait], [trai], [ˈveri], [eit], [get], [ðeə], [æt] (or [ɛt]). From the previous discussions, however, we have seen that there is no such thing as *the* correct phonemic transcription for any given language. According as we emphasize one or another factor in the size of the unit, method of phonemic grouping, and choice of symbols, we arrive at one or another form of phonemic solution. There is nothing in our definition of a phoneme or any other of the definitions quoted that can decide for us, for example, whether the Chinese [ɕ] shall be a member of [x] or [ʂ] or [s], or how the [ɩ] in [aɩ], the [j] in [ij], the [ɪ] in [ɪt], and the [j] in [jęs] should be grouped into phonemic classes. The definition *permits* us to devise ways and means of grouping together distinguishable sounds that are not distinctive with respect to the particular system of phonemic grouping. It also implies that certain sounds in a language are never distinctive in that language by any reasonable manner of symbolic juggling, e.g., the difference between the [k]'s in *keep, call, coo,* etc. and the [h]'s in *heap, hall, who,* etc. can never be considered as being distinctive, unless we should do the very unnatural thing of considering all the vowels [iː] [ɔː], [uː] etc. as non-distinctive members of one vowel phoneme X, the value to be determined by the nature of the preceding consonant k_1, k_2, k_3, etc., h_1, h_2, h_3, etc., or $zero_1$, $zero_2$, $zero_3$, etc. (i.e., in words like *eat, all, ooze*). But many sounds in a language are neither distinctive nor non-distinctive *per se,* but depend upon our particular manner of phonemic treatment. Thus, by writing *up, owe, oil* as [op], [ow], [ɔjl], Bloomfield considers the difference between the first elements

in *up* and *owe* as non-distinctive and the difference between the first elements in *owe* and *oil* as distinctive. But precisely the reverse thing will have to be said if we treat the same sounds as [o], [ɔw], [ɔj], a modification which would do no damage to Bloomfield's system as a whole either by way of compromising the parsimony of letters, or by way of introducing queer symbols. Again, in most of the Wu-dialects, in words of the type [tɕⁱɑ], [ɕⁱɑ] [ɲⁱɑ], etc., as against [kɑ], [xɑ], [ŋɑ] the [ⁱ] is so short that it can be considered as a glide of the preceding consonant and can be left out in the transcription, in which case the difference between [k], [x], [ŋ] and [tɕ] [ɕ], [ɲ] would be considered distinctive. On the other hand, if we write the [ⁱ] on the line, then we could consider the [tɕ]-series as members of the [k]-series phonemes: [ki], [xi] [ŋi], and it is now the difference between [ɑ] and [iɑ] that is distinctive. In practice, no phonetic transcription is so narrow and concrete as to distinguish between the [h]'s in [he], [ʰɛ], [ɦɔ] in any language, and no phonemic transcription is so broad and so purely abstract as to group English [h] and [ŋ] under the same phoneme [ɧ]. Between these extremes, there are all intermediate proportions of phoneticity and phonemicity. On the whole, we may say that a phonetic transcription is one which makes use of all the usual distinctions which the majority of phoneticians are expected to be familiar with, irrespective of their distinctiveness in words, and that a phonemic transcription is one which, given a particular set of directions of approach, makes only such distinctions as are necessary in distinguishing words from that particular set of directions.

The reader will notice the unsatisfactory nature of the phrase "the usual distinctions which the majority of phoneticians are expected to be familiar with." This comes from the unsatisfactory nature of the actual state of affairs. In the field of descriptive phonetics, there is nothing like the near unanimity of opinion which exists among physicists, either as to the organization of facts or as to the use of symbols for referring to them. Thus, Bloomfield says, "The phonetician's equipment is personal and accidental, he hears those acoustic features which are discriminated in the languages he has observed.....He should remember that his hearing of non-distinctive features depends upon the accident of his personal equipment, and that the most elaborate account cannot remotely approach the value of a mechanical record."[1] This is all true to a great extent, but in the opinion of the writer, Bloomfield is going too far in saying further: "Only two kinds of linguistic records are scientifically relevant. One is a mechanical record of the gross acoustic features, such as is produced in the phonetic laboratory. The other is a record in terms of

1. Bloomfield, *Language*, pp. 84-85.

phonemes, ignoring all features that are not distinctive in the language. Until our knowledge of acoustics has progressed far beyond its present state, only the latter kind of record can be used for any study that takes into consideration the meaning of what is spoken." We need not, however, be worried if we cannot read or copy the grooves of a phonograph record. The phonograph record is at best an *icon*, or a picture, not a *symbol* in the usual sense of something that we can "read" and "write." Nor need we be worried that the number of sounds in human speech is infinite. The number of distinguishable sounds in human speech is relatively small, limited by the condition of *oral-auditory transmission of phonemic distinctions from one generation to the next.* When the average actual difference falls below a certain finite limen, the distinction becomes unstable, and the two phonemes soon coalesce into one later phonogenic member. We cannot say, as Bloomfield seems to imply, that phonetic transcriptions are mostly subjective and that phonemic transcription are mostly objective. We already saw how phonemic transcriptions are not unique and to that extent subjective. On the other hand, there is also a certain degree of practical agreement as to the non-phonemic use of symbols in general phonetics. For purposes of (1) citation of forms where a feature which is non-distinctive in the language cited is relevant to the point under discussion, (2) giving forms of words or sounds in comparative dialectology, (3) noting incipient or vestigial traces of sound-change, (4) impartial consideration of the gross features of a language before a good phonemic system has been worked out for it, and (5) as a less worthy purpose, for pedagogical use,—for all these, a narrow phonetic transcription is sometimes very useful and sometimes quite indispensible. One should not do the worst of narrow transcriptions all the time, but one should be prepared for the worst at any time. The dialect alphabet of Lundell, used by Karlgren in his *Phonologie Chinoise*, both in his main discussions and in the appended dialect dictionary, is a very narrow and non-phonemic transcription. The writer has nevertheless found the system thoroughly usable and understandable, and although for typographical reasons, he has changed it into IPA form in the Chinese translation,[1] he has been able to equate the symbols of the system with relatively few additions and few doubtful points of classification arising from the number of scale-steps problem. In the writer's own experience in the recording of Chinese dialects, he found that besides the matching and comparison of words with related sounds, a very important procedure is to give a reasonably narrow phonetic transcription at the start, so that we have materials to base our decisions upon when we come to questions of choice among alternate treatments.

1 中國音韻學研究，趙元任，羅常培，李方桂合譯， Shanghai, 1934.

Bloomfield observes rightly that phonetic transcriptions are often inconsistent as to what features to include and what features to neglect. This difficulty can be met in two ways. In the first place, we can lay down as a principle of symbolology that the position of a symbol in its context may be considered to be one constituent of the symbol. Thus, there is no inconsistency in the figure 1 meaning 1×10 and 7 meaning 7×1 in the form "17," as the symbol 1 is not just "1," but "1 in the second position." Similarly, there is no inconsistency in the symbol > meaning "greater than" in $19 > 17$ and meaning "changes into" in $p > f$, or even between the two uses of > in $a > o$ according as the formula occurs in an article on phonetics or in one on mathematics.[1] So in discussions on diphthongs, we may need to mention forms like [čaj], [čɑe], [čœɛ], etc., while in discussions on affricates, we may have reference to [tʂai], [tʃai], [tɕai], [tɹ̯ai], etc., just as Bolling finds it perfectly in order to write *Enroughity is coming.—The Enroughities are coming,* so long as the discussion is about the ending of the plural.[2] But if our discussion should turn on the forms of the indefinite article, it would then be necessary to write: [ɛn eg] but [ej ˈdaːbi] (the correct pronunciation of the name *Enroughity* according to Bolling), as it would not bring out the point at all if we wrote: *an egg,* but *a Enroughity.*

For avoiding too much inconsistency in the citation of forms, both Karlgren and users of the IPA have resorted to the distinction between broad and narrow transcriptions apart from considerations of significant distinction. Karlgren's practice, as carried out in his *Phonologie* (pp. 260ff.), is very consistent. He has a set of bold-faced letters for a broad transcription, under each of which he puts a number of the Lundell's letters, which are always in italics. Thus, what correspond to the [ɛ] and [æ] in the IPA are both grouped under ä, what correspond to [ʂ], [ɕ], [ʃ] in the IPA are grouped under [š], and so on. There are a few cases of overlapping groups, but on the whole the groups are mutually exclusive. The relation between the two sets is therefore very much like that between phonemes and its members except that no reference is made to word distinction. A similar tendency is noticeable among users of the IPA, but no systematic division has ever been made between a narrow and a broad transcription. Nevertheless, there are certain unsystematic traditions among phoneticians which are based, on the whole, on the identity of the letters in the roman alphabet.

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1. In discussions like the present, where there may be a call for "narrow symbols," one could use $\rightarrow$ for "changes into" and > for "greater than," thus making peace among mathematics, phonetics, and chemistry.

2. From editorial note on R. G. Kent's review of Bloomfield's *Language* in the journal *Language,* X, 1, 1934, pp. 50.

Thus, *r* is somehow recognized as a broad form covering [r] and [ʀ], whereas [t] and [q] are not covered by any broad form. Similarly, [e] and [ɛ] are felt as members of a group of the *e*-type in a way that [i] and [e] do not seem to be. All this points to a conception which no one consciously recognizes, but which seems to be assumed by many, that there are such things as phonemes in general, apart from reference to any particular language, and that all we need to do either for the study of one language or for comparative work is to use one consistent phonemic transcription for all languages. This would of course be recognized by any one as an impossible illusion as soon as the situation is thus made explicit, as we may be called upon at any time to make phonemic distinctions between shades of sounds whose differentiation we never anticipated in either our narrow or broad system of phonetic symbols. The existence of the tradition of usage, however, is real. It is true that the existence of only one common letter *r* for [r] and [ʀ] but two common letters *t* and *k* for [t] and[k] (or[q]) is a matter of historical accident. But we shall see the significance of this accident when we note that as a matter of fact most of the languages which phoneticians, or at least European phoneticians, have studied, do take [t] and [k] as separate phonemes, while [r] and [ʀ] rarely, if ever, occur as separate phonemes. The idea of general phonemes, which we have just proposed and condemned in the same breath, is therefore not entirely baseless. Without entertaining the idea of general phonemes as such, the writer wishes to propose the term *typical phoneme*, to be defined as those groups of sounds which very often go together to form phonemes in many of the major languages studied by phoneticians. This definition of course makes the idea of a typical phoneme depend again on historical accident, the fact that most contemporary phoneticians are speakers and writers of the Germanic and Romance languages. Thus, for a broad transcription using typical phonemes, a European would group [p] and [p‘] under one typical phoneme as against [b][1], while an unsophisticated Chinese phonetician would most likely group [p] and [b] under one typical phoneme as against [p‘].

The troublesome part of the transcription problem comes from the inconsistency in using the same symbol sometimes in a general and sometimes in a particular sense. In the citations in this article, the writer has found it hard to do better, and has tried to manipulate the context (taken as part of the symbolic system) in such a way as to eliminate ambiguity. But there is always the danger of slips. When we refer to the English [i], one may not know whether it is narrow [i]

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1. Except speakers of certain German dialects.

or [ɪ] that is meant.[1] This is very similar to the old practice of referring to the ancient Chinese initials 照, 穿, 牀, 審 in this way:

General names: 照穿牀審
For the apical series: 莊初牀山 [tʂ], [tʂʻ], [dʐʻ], [ʂ]
For the dorsal series: 照穿乘審 [tɕ], [tɕʻ], [dʑʻ], [ɕ]

so that when 照 is mentioned, one is at a loss as to whether it is 照 in general (including both [**tʂ**] and [**tɕ**]) that is meant, or only 照 [tɕ] as against 莊 [tʂ]. He has therefore proposed the following names for the differentiated series, reserving the traditional names for the general sense, incidentally also using an inclusive broad transcription for the general series, thus:

General names: 照穿牀審 [č], [čʻ], [ǰ], [š]
For the apical series: 莊初崇生 [tʂ], [tʂʻ], [dʐʻ], [ʂ]
For the dorsal series: 章昌乘書 [tɕ], [tɕʻ], [dʑʻ], [ɕ]

Karlgren's use of a special series of bold-faced types is based on the same principle. Symbols may be as general and inclusive as we may have use for, but must not be vague and ambiguous. An approach to this method of having both general and particular use of symbols is made in connection with the usage of a few symbols in the IPA. Thus, the symbol [ə] is usually understood to be a general form for [ɘ] (half-close) and [ɐ] (half-open). [ ] and [ʒ] may be used either for [ʂ] and [ʐ] or for [ɕ] and [ʑ] respectively. This latter, however, is less satisfactory, as in the dialect of Lintzy (臨淄), Shandong, [ʂ], [ʃ], [ɕ]: all three exist as separate phonemes, in which the [ʃ] series is intermediate between apical and dorsal articulations of the tongue and is identical with English [ʃ] except that there is no protrusion of the lips. [š] and [ž] would be better general symbols, though they are not properly IPA letters.

SUMMARY.

We have proposed a new definition of a phoneme and have endeavored to show that given a language, there is not necessarily one unique solution for the problem of reducing its sounds into elements. We have considered what factors can influence, and have influenced, the phonemic treatment of languages: the variability of the size of the phonemic unit, including the admission of zero symbols and zero sounds, the grouping of phonemic membership, and the choice of actual symbols. Because phonemic solutions are not unique, it is necessary, before arriving at solutions, to have recourse to considerations of descriptive phonetics

1. On the principle of non-uniqueness of phonemic transcriptions, we cannot prohibit the writing of the vowels in *eat*, *it* as [i], [ɪ] and insist on the writing of [iː], [i] or of [ij], [i].

and the use of phonetic transcriptions. These are also necessary for other purposes, such as the comparative study of dialects. We have also noted that there is a tendency among phoneticians to group together sounds under broad symbols, which form phonemes in a number of languages. and we have called them "typical phonemes," although there is no consistency in the use of symbols for these. It is hoped that a more consistent system of symbols be devised for indicating both narrow shades of sounds and typical phonemes for the purpose of phonetic and phonemic transcriptions, but for the time being, we have to let the context serve as part of the symbol to inform us as to shade (if particular) or scope (if general). It is not necessary to take serious exception to anyone's transcription so long as it is self-consistent and its interpretation is clear to the extent it is meant for, and so long as it does not claim unique correctness to the exlusion of other possible treatments. Usage may in time become unified, but problems will always vary. Our motto must be: Write, and let write!

中文撮要

近年提倡音位標音法的各著作家，在他們的言論中，往往像已經假定有一個語言只有一種可能的音位化法。本文就是要證明音位標音法，對於任何語言，不是單答案性的，乃是有多少可能方式的答案的。從事實上人家用的各種標音法，可以尋出許多影響答案的因子出來。

1. 單位的尺寸問題。——平常說"一個音一個符號"，其實常常有多音一號或一音幾號的標音法。在極端的例就發生零符號零音問題。——比方德文元音起頭字必有[ʔ]音，但不寫也可以知道它的存在，這是零符號代表音。"陰平無號"也是零號的例，[ˈbaːdn̩]寫作[ˈbaːdən]就是有[ə]號而無音的例。

2. 組類問題。——哪些哪些音歸為一個音位，這問題是跟着許多因子變的。(a)音質準確度，(b)全系統簡單或對稱的要求，(c)音位總數減少的要求，(d)本地人對於音類的見解，(e)字源的顧及，(f)音位與音位間局部重複的避免，(g)讀音知位，見位得音互指可能的要求。這些要求往往互相衝突，對這上對那上輕重的不同，就會得不同的答案。

3. 符號的選擇。——影響組類的各因子有些也影響符號的選擇。此外有(a)用普通羅馬字的傾向，(b)用較常見的語音符號的傾向，(c)分度的數目的不同，(d)增加'麻子"符號的避免，(e)跟別的音位標音法衝突的避免。

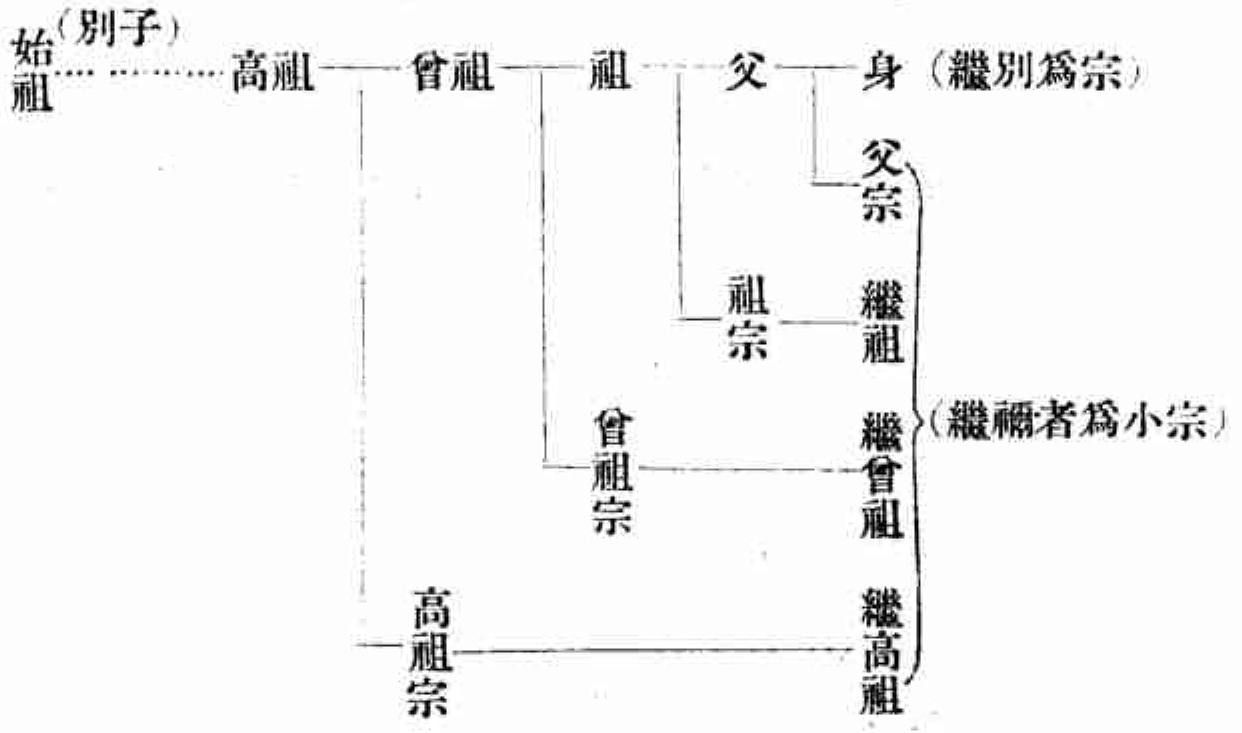
近年有人主張只有音位標音法是有價值的，所謂嚴式標音法或音質標音法是主觀的，沒有意義的。本文從音位標音法多能性的原則證明在音位答案未擬定以前，非得用純粹語音學跟它所用的嚴式音標，才能夠作擬音位答案的初步的工作。從本人方言調查的經驗，深感到這種音質標音法的必要。此外還有稱述某某語言中某某字的音，其中所指的音素在音位標音法所不必標者，而稱述時要提到者；比較各相近的方音；注意音變的初兆或殘跡；為教學時辨別雖同音位而音質相差很遠的音，——以上各種事情都是用得着音質標音法的。至於說各作家所用嚴式不同，但也不是完全不同，不能因此就作因噎廢食的主張。

有些近似的音組，因為它們在一般學者所遇見的語言當中常常合成音位，這種音組可以稱它們作"常見音位"，它們雖常常成為音位，但有時並不。標這種常見音位，往往用其中各音值之一的符號，例如用[r]式表[ɾ]或[ʀ]，那就有如分照母為莊：照，提起"照"字就不知道是指照總類還是與莊對待的照。用音標也應該用作者所提議分照母為莊：章的辦法為原則。但在國際音標沒有改一致化，系統化以前，我們只可以拿上下文來定所用各符號的功用，如本文所引各例標音法就只好靠上下文來定它的確實的意義。

宗法考源

丁山

禮記喪服小記述周人宗法曰："別子爲祖，繼別爲宗，繼禰者爲小宗。 有五世而遷之宗，其繼高祖者也。 是故祖遷於上，宗易於下，尊祖故敬宗，所以尊祖禰也"。大傳亦曰："別子爲祖，繼別爲宗，繼禰者爲小宗。 有百世不遷之宗，有五世則遷之宗。 百世不遷者別子之後也，宗其繼別子者 別子下今本衍之所自出四字 ，百世不遷者也；宗其繼高祖者，五世則遷者也"。 白虎通義曰："宗其爲始祖後者爲大宗，此百世之所宗也；宗其爲高祖後者五世而遷者也；故曰，祖遷於上，宗易於下。宗其爲曾祖後者爲曾祖宗，宗其爲祖後者爲祖宗，宗其爲父後者爲父宗；父宗以上至高祖宗皆爲小宗，以其轉遷，別於大宗也。 別子者自爲其子孫祖，繼別者各自爲宗。 所謂小宗有四，大宗有一，凡有五宗，人之親所以備矣"。 此其敘述，比禮記尤爲詳明。 若爲世系，當如下圖：



高祖宗比於大宗之曾祖，則爲父宗；曾祖宗比於大宗之父，則曾祖宗爲祖宗，祖宗亦爲父宗；父宗，降至大宗之子則爲祖宗，降至大宗之孫，則爲曾祖宗，祖宗，降至大宗之子爲曾祖宗，至大宗之孫則爲高祖宗；曾祖宗降至大宗之子則爲高祖宗；高祖宗降至大宗之子則遷；此所謂"祖遷於上，宗易於下，繼高祖者五世則遷，百世不

遐者別子之後也"。爾雅釋親："父爲考，父之考爲王父，王父之考爲曾祖王父，曾祖王父之考爲高祖王父"。又曰："子之子爲孫，孫之子爲曾孫，曾孫之子爲玄孫，玄孫之子爲來孫，來孫之子爲晜孫，晜孫之子爲仍孫，仍孫之子爲雲孫"。衛太子蒯聵文王之二十世孫，而襄公之孫也，其禱於文王曰："曾孫蒯聵，敢昭告皇祖文王，烈祖康叔，文祖襄公"，哀二年左傳不曰仍孫雲孫，亦不曰玄孫，而曰曾孫；則周頌"惠於文王，曾孫篤之"，鄭玄箋云：'曾猶重也，自孫之子而下，事先祖皆稱曾孫"，最爲確論。書金縢："周公乃告太王王季文王，史乃祝冊曰：惟爾玄孫發遘厲虐疾，若爾三王，是有不子之責於天"；其代武王稱玄孫，實於親屬不倫。武王者，文王子，王季孫，太王之曾孫也，以曾孫爲玄孫，可知玄孫之稱明係後人僞託之誤，而金縢之僞，左傳僖二十八年"及其玄孫，無有老幼"，玄孫疑爲曾孫之誤，或出于後人追改，亦於以得有力之證明。與曾孫對立者爲曾祖，顧詩書彝器刻辭絕無曾祖明文，但有高祖，大祖，皇祖，藝祖，文祖，烈祖之稱。商頌："奏鼓簡簡，衎我烈祖"，又曰："嗟嗟烈祖，有秩斯祜"，烈祖者，有功烈之祖也。毛傳云書堯典："舜讓於德，弗嗣，正月上日，受終於文祖"，又曰："歸，格於藝祖"，藝祖者，禰廟也；此用馬融說。文祖者，堯大祖也司馬遷說。皇祖，杜預左傳注亦訓皇爲大，詩常武："南仲大祖，大師皇父"，傳箋無釋，而詩之稱皇祖尤衆。魯頌閟宮，既曰；"皇皇后帝，皇祖后稷"矣，又稱"皇祖周公，亦其福女"；周頌閔予小子，既曰；"念茲皇祖，陟降庭止"，又稱"於乎皇考，永世克孝"；皇祖可謂大祖，則皇考不得謂之大考，鄭箋故又訓皇爲君。案：金文晉邦盦銘，"我皇祖唐公，口受大命，左右武王"，秦公敦銘，"丕顯朕皇祖，受天命，鼏宅禹蹟"，齊鞷子綸鎛銘，"用享用孝於皇祖聖叔，皇妣聖姜，於皇祖又成惠叔，皇妣又成惠姜，皇考遵仲，皇母"，皇祖烈祖，意實相近。若夫高祖，爾雅謂卽曾祖之考。卜辭則曰，"高祖夒，高祖亥，高祖乙'，均爲遠祖或始祖之稱。書盤庚："肆上帝將復我高祖之德越亂我家"，高祖謂湯，亦遠祖也。其在春秋，郯子曰。"我高祖少皞摯之立也，鳳鳥適至，故紀於鳥爲鳥師而鳥名"。昭十七年左傳其在戰國，齊威王因脊作鐘曰："其唯因脊揚皇考，邵緟高祖黃帝，保㚟𢔶文"，另詳拙著由陳侯因資鐘銘黃帝論五帝亦莫不稱始祖爲高祖。然則高祖者遠祖也，始祖也，非所謂"曾祖之考"也：曾孫者遠孫也，亦非如爾雅之限於孫之子

而已也。　以詩書彝器銘識考之，嘗疑周人親屬稱謂，上終於祖，下終於孫，祖之考爲祖，祖之祖亦爲祖，無曾祖高祖之別；孫之子爲曾孫，孫之孫亦爲曾孫，無玄孫來孫之名；其所謂曾孫，遠孫之通稱；其所謂高祖，亦遠祖之通稱。　高祖曾孫相對爲名，所以表示其世代悠遠，無所謂曾祖玄孫。　自不得有繼曾祖宗，繼高祖宗者卽繼別之大宗，自不得復爲繼禰之小宗。

故論周人宗法，蓋唯繼高祖之大宗，繼祖繼父之小宗，三宗而已。　逮秦漢博士儒生，因曾孫而創稱祖之考爲曾祖，復因祖之祖爲高祖而創稱玄孫，以曾孫爲繼曾祖宗，以玄孫爲繼高祖宗，別以歷世相沿之嫡長子爲繼別大宗，於是焉有五宗。　五宗者秦漢以後之新制，必非周人之舊法。　詩大雅板："价人維藩，大師維垣，大邦維屏，大宗維翰。　懷德維甯，宗子維城，無俾城懷，無俾斯畏"。鄭玄箋："大宗，王之同姓適子也；宗子，謂王之適子"。是宗子，大宗，皆適子也。然考之彝器刻辭：

　　戲鐘銘："戲作寶鐘，用追孝於己伯，用亯大宗，用濼好宗"。

　　𠂇𤋱壺銘："𠂇𤋱作尊壺，用亯孝於大宗"。

　　陳逆簠銘："余寅事齊侯，懽卹宗室，鑄茲寶簠，以亯孝於大宗皇祖，皇妣，皇考，皇母，用匄永命，眉壽萬年"。

　　陳逆𣪕銘"陳氏裔孫逆作爲先祖大宗𣪕，以貿兼命"。

大宗之上，或曰"用追孝於己伯"；大宗之下，或曰"皇祖，皇妣，皇考，皇母"；而其連文，皆稱亯孝。　詩小雅天保："吉蠲爲饎，是用孝亯"，傳；"亯，獻也"，箋云：謂將祭祀也"。　周頌載見："率見昭考，以孝以亯"，箋亦云；"以致孝子之事，以獻祭祀之禮"；則凡所謂亯孝者皆享祀孝敬之意。　孝敬可施於適子，享祀不可施於適子，但可用於祖考之廟，是金文所見之大宗，皆謂祖考宗廟，非如鄭玄說"王之同姓適子也"。　故金文有時不稱大宗，逕曰宗廟。　如：

　　𢿌鼎銘："南公有嗣𢿌作尊鼎，用亯於宗廟"。

　　斧伯𣪘銘；"用作朕皇考武斧幾王亯𣪘，用好 讀爲孝 宗廟，亯夙夕好朋友，雩百諸婚遘。　歸夆其萬年日用享於宗室"。

或省稱曰宗：

周爹壺銘："周爹作公日己尊壺，用享於宗"。

叔氏林鐘銘："作朕皇考叔氏林寶鐘，用亯於宗"，

琱生毁銘；"對揚朕宗君其休，用作朕烈祖召公嘗毁，用亯於宗"。

蓋宗卽廟也。儀禮士昏禮記："承我宗事"，鄭玄注："宗事，宗廟之事"。許愼說文："宗，尊，祖廟也。从宀示"，又曰："示，神事也"。神示一聲之轉，周人言鬼神，於殷則言示詳下文，。論語述而："禱爾於上下神祇"，宗周鐘銘："惟皇上帝百神"，此天神也。呂覽民順："使上帝鬼神傷民之命"，陳肪毁銘："龔盟䰠神，虔龔愄忘"，此鬼神也。天神所居曰大室，鬼神所居曰大宗，然則𠦪伯毁銘："用享於宗室"，宗室卽宗廟。

仲般父毁銘："中般父鑄毁，用朝夕亯孝於宗室"。

曼龔父盨銘："曼龔父作寶盨，用亯於宗室"。

師器父鼎銘："師器父作尊鼎，用亯孝於宗室"。

䢅伯毁銘："俘金，用作宗室寶尊彝"。

㚖毁銘："㚖作文祖考尊寶毁，用孝於宗室"。

善鼎銘："善作宗室寶尊，唯用錫福於前文人，康綏共屯。余其用各我宗子，雩百姓"。

凡此宗室，當如詩采蘋："於以奠之，宗室牖下"傳云："大宗之廟也"。士昏禮記："祖廟未毁，教于公宮，三月；若祖廟已毁，則教於宗室"；以宗室對祖廟爲文，尤可證宗室卽宗廟。所差異者，一爲禰廟，一爲大宗。獻鐘銘旣云："用享宗室"，又云："用樂好宗"，好宗卽考宗，大宗卽宗室。宗室爲大宗，則祖廟考宗，皆繼禰之小宗。由是言之，大宗者，太廟也；小宗者，禰廟也；宗法者，初以辨先祖宗廟之昭穆親疏，非以別繼祖繼禰後世子孫之嫡庶長幼也。卽以後世宗法名稱論：士昏禮記"宗子無父母命之，親皆沒，己躬命之"，注："宗子者，適長子也"。則宗婦自爲適長子婦，如禮記內則"適子庶子祇事宗子"注所云："宗，大宗"。而特牲饋食禮記，旣有大宗之主婦，復有"宗婦北堂東面北上"所謂族人婦之宗婦。如特牲饋食禮記宗婦旣爲族人之婦矣；而金文所見：

宗婦鼎銘："王子剌公之宗婦䣄嬰爲宗彝𩰫彝，永寶用。 以降大福，保辥䣄國"。

晉邦盦銘："惟，余小子，整辥爾家，宗婦楚邦，烏口萬年，晉邦隹翰"。

一則以宗婦爲王子剌公之適婦，一則以宗婦爲楚邦之小君晉邦盦爲晉侯嫁女楚王媵器。如士昏禮記宗子卽適長子矣；而善鼎銘："余其用各我宗子雩百姓"，以宗子百姓並稱，又以宗族子弟爲宗子。 是宗子不必爲適子或適長子，宗婦亦不必爲族人之婦。 國語魯語："公父文伯之母，欲室文伯，饗其宗老，老請守龜卜室之族。 師亥聞之，曰：善哉！男女之饗，不及宗臣，宗室之謀，不過宗人"。 韋昭注："家臣稱宗老今本誤爲老宗，宗屬下文讀，宗人主禮樂者也。 宗人則宗臣也"。 儀禮喪禮傳："公，卿，大夫，室老，士，貴臣"，注："室老，家相也"。 是室老，宗老，皆宗室之家臣也"。而陳逆簠銘既曰："亯孝大宗"，又曰："懽卹宗室"，以宗室爲宗族之族衆。 辛中姬鼎銘："用亯孝於宗老"，宗老之名，固當於詩思齊"惠於宗公，神罔時怨"，箋云："宗公，大臣也"。 顧毛傳則云："宗公，宗神也"，孔穎達正義："書序云，班宗彝，中庸云，陳其宗器，皆謂宗廟爲宗，下又頻言神罔，則宗公是宗廟先公"，宗老縱不得謂卽宗廟祖考，亦當爲宗室長老，其非宗室之家臣，可斷言也。 知宗老，宗公，非必宗室之家臣，知宗室非必大宗之家，鄭玄士昏禮注，宗室，大宗之家，知宗子非必適子，宗婦非必族人之婦；則言宗法者專據禮記所謂適，庶，長，幼以辨繼別繼禰，其本多舛，其流必紊。 何也？宗者，宗廟也；宗法者，所以辨宗廟之昭穆也。 魯語："夏父弗忌爲宗，烝，將躋僖公。 宗有司曰，非昭穆也。曰，我爲宗伯，明者爲昭，其次爲穆，何常之有？有司曰，夫宗廟之有昭穆也，以世次之長幼而等胄之親疏也。 夫祀，昭孝也，各致齊敬於其皇祖，昭孝之至也。 故工史書世，宗祝書昭穆，猶恐其踰也，今將先明而後祖？自玄王以及主癸莫若湯，自稷以及王季莫若文武，商周之烝也，未嘗躋湯與文武，爲踰也。 魯未若商周而改其常，無乃不可乎"？春秋，"八月，丁卯，大事與大廟，躋僖公"，公羊傳亦曰："大事者何？大祫也；大合者何？合祭也。 其合祭奈何？毀廟之主，陳於大祖；未毀廟之主，皆升，合食於大祖，五年而再殷祭。 躋者何？升也。 何言乎升僖公？譏。何譏爾？逆祀也。 其逆祀何？先禰而後祖也"文公二年。 由公羊傳說，則祖廟卽大

廟，禰廟卽宗廟；由魯語說，則躋僖公卽亂祖廟之昭穆；其在禮記大傳則曰："上治祖禰，尊尊也；下治子孫，親親也；旁治昆弟，合族以食，序以昭繆 讀爲穆 ；別之以禮義，人道盡矣"。 其在祭統則曰："凡賜爵，昭爲一，穆爲一，昭與昭齒，穆與穆齒，凡羣有司皆以齒，此之謂長幼有序"。 直以祖廟之昭穆推而序後世子孫之長幼，然則禮家所辨後世子孫之宗法，實蛻變於先祖宗廟制度。 其所謂大宗繼祖，卽祖廟爲大廟爲大宗之演變；其所謂小宗繼禰，卽禰廟爲小宗之演變。 考宗法起源者，不當求之後世子孫之適庶長幼，當反求諸宗廟之昭穆親疏：故曰，宗法者，宗廟之法也。 祭法："有虞氏禘黃帝而郊嚳，祖顓頊而宗堯；夏后氏亦禘黃帝而郊鯀，祖顓頊而宗禹；殷人禘嚳而郊冥，祖契而宗湯；周人禘嚳而郊稷，祖文王而宗武王"。魯語亦曰："有虞氏禘黃帝而祖顓頊，郊堯而宗舜；夏后氏禘黃帝而祖顓頊，郊鯀而宗禹；商人禘舜而祖契，郊冥而宗湯；周人禘嚳而郊稷，祖文王而宗武王"。 宗禘之人，雖頗違異，郊宗之禮，大抵不殊。 魯語又曰："幕能帥顓頊者也，有虞氏報焉；杼能帥禹者也，夏后氏報焉；上甲微能帥契者也，商人報焉；高圉太王能帥稷者也，周人報焉；凡禘，郊，宗，祖，報，此五者國之典祀也"。 以依四代世系論之，則禘者禘其祖之所自出，郊者郊其遠祖之有功，祖爲受命之君，宗爲開國之君，報者報其中興之德。 以宗法論之，有虞氏夏后氏並祖顓頊，殷人祖契，周祖文王，皆所謂"別子爲祖"；有虞氏宗舜，夏后氏宗禹，殷人宗湯，周宗武王，皆所謂"繼別爲宗"；虞夏遠矣，其詳不可得而聞，殷人既有別子之祖，繼別之宗，書高宗肜日，"典祀無豐於昵"，馬融注："昵，考也，謂禰廟也"。 則殷亦有禰廟小宗。 有大宗，有小宗，是宗法起源不始宗周。 當在有殷之際或其前世。 所不同於宗周宗法者，卜辭云，

乙亥，又ㄐ歲在小宗，自上甲。 殷虛書契後編下，第四十二葉。

丁丑卜，在小宗，又ㄐ歲。 同上版。

既以上甲爲小宗矣。 復有辭云：

丙午貞，辛亥，酒，肜，自上甲在大宗彝。 董作賓甲骨文斷代研究例引容氏拓本。

丁亥卜，在大宗，又ㄔ伐綃甲十小宰，自上甲。 殷契佚存一三一版。

己丑卜，在小宗，又彳歲自大乙。 同上版。

又以上甲為大宗。 大乙卽天乙，湯之廟號也。 由前祭法云，“殷人祖契而宗湯，湯，大宗也”，卜辭或云“在小宗”。 是殷人宗法，不以宗之大小別祖禰，不特異於禮家所傳“繼別為祖，繼禰者為小宗”，且與前文所論小宗為禰，大宗為祖者亦不符，是知祖為大宗，禰為小宗者宗周之宗法，非殷人宗法也。 殷周宗法之異同，不獨如禮家所傳之小宗大宗而已也。 禮記王制，“天子七廟，三昭三穆，與大祖之廟而七；諸侯五廟，二昭二穆，與大祖之廟而五；大夫三廟，一昭一穆，與大祖之廟而三；士一廟，庶人祭於寢”。 祭法：“王立七廟，一壇一墠，曰考廟，曰王考廟，曰皇考廟，曰顯考廟，曰祖考廟，皆月祭之；遠廟為祧，有二祧，享嘗乃止；去祧為壇，去壇為墠，壇墠有禱焉，祭之，無禱乃止。**去墠曰鬼。 諸侯立五廟，一壇一墠，曰考廟，曰王考廟，曰皇考廟，皆月祭之；顯考廟，祖考廟，享嘗乃止。大夫立三廟，一壇，曰考廟，曰王考廟，曰皇考廟，享嘗乃止；顯考祖考無廟。士二廟，一壇，曰考廟，曰王考廟，享嘗乃止；顯考無廟，有禱焉。 官師一廟，曰考廟，王考無廟而祭之。 庶人無廟，死曰鬼”。 大戴記禮三本亦曰：“有天子者事七世，有國者事五世，積厚者流澤光，積薄者流澤卑”，是周之宗廟，相傳天子有七也。但七廟王制謂卽大祖廟與三昭三穆，祭法謂卽考，王考，皇考，顯考，祖考，與遠祖二祧。 孔穎達正義，“王考廟者，祖廟也；皇考者，曾祖廟也；顯考廟者，高祖也；祖考廟者，始祖也；祧謂文武廟也。 文武廟為祧，禮家說者甚衆，姑置不論。曾祖之名，非宗周時所有，何得有曾祖廟？ 況自金文證之，凡所謂祖考者皆祖與父之合稱，顯考，皇考，皆考也，如祭法說，則天子七廟，為考廟三，祖廟二（王考卽祖廟，故有二），遠祖祧廟各一。 祖廟何以二？ 考廟何以三？ 詩書無徵，蓋秦漢間儒生之妄言，由史實言，左昭右穆，其事不能始於昭王穆王之前，周別廟制，何由而具三昭三穆？ 無昭無穆，何由而知天子七廟？ 周書世俘：“辛亥，武王乃翼，矢珪矢憲，告於天宗上帝，王烈祖自大王，大伯，王季，虞公，文王，邑考以列升，維告殷罪”。 又曰：“時四月，既旁生魄，越六日庚戌，武王朝至，燎於周。武王在祀，大師負商王紂縣首白旂，妻二首，赤旂，乃以先馘入燎於周廟”。 周廟由吾前說，卽是天宗，天宗者，大宗也。 武王克商，祀於大宗者惟高祖大王，祖大

伯王季虞公，父文王，兄邑考，充類言之，四世六廟而已，無所謂七廟也。 由後儒所傳宗法言，大王爲祖，大伯卽繼別之大宗，王季虞公爲小宗；王季文王爲大宗，則大伯虞公皆小宗，以小宗合祀於大宗，則大宗自可祀於小宗，是周初宗法，固未嘗以大小別嫡庶長幼，與殷人所謂大宗小宗，固無異也。 周之宗廟，禮家又有親盡則毀之說，如朱熹或問：

天子之廟，其制若何？ 曰，唐之文祖，虞之神宗，殷之七世三宗，其詳今不可考；獨周制猶有可言。 然而漢儒之說，又有不同矣。 謂后稷始封，文武受命而王，故三廟不毀，與親廟四而七者諸儒之說也。 謂三昭三穆與太祖之廟而七，文武爲宗，不在數中者，劉歆之說也。 但如諸儒之說，則武王初有天下之時，后稷爲太祖，而祖紺居昭之北廟，太王居穆之北廟，王季居昭之南廟，文王居穆之南廟，猶爲五廟而已。 至成王時，則祖紺祧，王季遷而武王祔；至康王時則王季祧，武王遷而成王祔；自此以上，亦皆且爲五廟而祧者藏於太祖之廟。 至穆王時則文王親盡當祧，而以有功當宗，故別立一廟於西北而謂之文世室；於是成王遷，昭王祔，而爲六廟矣。 至共王時則武王親盡當祧，而亦以有功當宗，故別立一廟於東北，謂之武世室；於是康王遷，穆王祔，而爲七廟矣。 自是之後，則穆之祧者藏於文世室，昭之祧者藏於武世室，而不復藏於太廟矣。

案師兌毀銘："隹元年五月初吉甲寅，王在周，各康廟，卽位，同仲右師兌，入門，立中廷，王呼內史尹册命師兌世師龢父嗣左右走馬"。 師龢父卽伯和父，卽共和攝位之共伯和，毀銘云："世龢父嗣左右走馬"，則師兌作毀時代，非宣王之元年，卽幽王之元年。 幽王爲康王八世孫，宣王爲康王七世孫，如朱熹及禮家說，宣幽之際，康王之廟，其毀久矣。 而毀銘云："王各康廟"，則康王之廟至宣幽之世，明明存在，是宗周時尙無毀廟遷祧之制，所謂親盡則毀者，又後儒附會七廟，削足適履之說也。 徵之卜辭，更無毀廟之跡。 卜辭既稱大乙在大宗小宗矣，又云：

癸卯卜，賓貞井方於唐宗。 後編上，第十八葉。

唐以音近，後人誤爲湯，湯卽大乙，是大乙雖祀於大宗小宗，猶有不毀之專廟。 此

猶可委曰："宗有德，廟不毀"也。　卜辭又曰：

口口卜貞大甲𢀛宗，用，八月。　殷契佚存一一五版。

上缺　中宗且乙，牛，吉。　戩壽堂所藏殷虛文字第三葉。

則太甲祖乙之宗，亦不毀矣。　祖乙廟號中宗，漢以來經師皆誤為太戊。　太戊太甲之宗何以不毀？　劉歆亦為之說曰；"天子八廟，七者其正法，數可常數也。　宗不在此數中，宗變也。　苟有德，則宗之，不可預為設數。　故殷於太甲為大宗，太戊為中宗，武丁為高宗。　周公為毋逸之戒，舉殷三宗，以勸成王。　由是言之，宗無數也"。　漢書韋玄成傳引　案：太甲廟號太宗，武丁廟號高宗，卜辭概尚未見，其數見者：

上缺　彝在中丁宗，在三月。　續編卷一，第十二葉。

在四祖丁宗。　佚存四一九版。

甲戌卜貞，武乙宗，其牢。　佚存九四一版。

甲子卜貞，武乙宗，丁，其牢茲用。　殷契徵文帝系，一三一版。

甲辰卜貞，武且乙宗，其牢。　佚存，九八四版。

甲寅卜貞，武且乙宗，其牢茲巛。　燕京大學藏殷契卜辭，二五二版。

戊戌卜貞，文武丁宗，其牢茲用。　殷契卜辭，二六七版。

丙午卜貞，文武丁宗，其牢茲用。　殷虛書契一，第廿三葉。

乙酉卜，賓貞丁宗，亾不若。　續編四，第廿五葉。

貞丁宗口鉞，亾𡆥。　後編下，第廿四葉。

己丑卜，告於父丁，其卿宗。　後編上，第五葉。

上缺　婦於癸宗，若，王弗每。　龜甲獸骨文字二，第廿五葉。

尚有中丁，四祖丁，武乙，武祖乙，文武丁，丁癸諸宗。　由殷之世系考之，太丁一，沃丁二，中丁三，所謂四祖丁卽祖丁；若屏閏位沃丁計之，則四祖丁卽武丁，武祖乙卽武乙，文武丁卽文丁。　文丁者帝乙之父而武乙之子也。　以周人宗法言，武乙為帝乙祖，文丁為帝乙父，皆禰廟也，例在不毀。　若中丁，四祖丁，旣無赫赫之功，又非帝乙考與王考，例當毀而祧之，仍而不毀，是殷人亦無毀廟之制也。　其所不毀者，不獨先祖之廟然也。　卜辭：

甲申卜，卽貞，其又於兄壬，於母辛宗。 後編上，第七葉。

貞南方敃妣乙宗，十月。 續編一，第卅八葉。

殷之先妣，以辛爲號者，就今卜辭所見，一爲武丁，一爲康丁；殷先王以壬爲號者，南壬卜壬而外，未之有聞；但卜壬母妣壬，南壬母妣丙，皆非妣辛，妣辛終不詳其爲誰祖之配。 若妣乙卜辭明謂示壬妾證詳後文，妾廟不毀，況先祖乎？ 殷無毀廟之制，卽無祧宗之法，殷無祧宗之法，卽無七廟五廟之限；或據商書佚文"五世之廟，可以觀怪"，呂氏春秋論大篇引 而謂殷世天子五廟，傎矣！

然則殷之宗廟果無親疏長幼之辨乎？ 曰，不然。 殷人所以辨親疏長幼者，示也，非宗也。 示，許君訓神事，而卜辭示壬示癸，魯語及史記殷本紀並作主壬主癸，春秋文二年："丁丑，作僖公主"，公羊傳："作僖公主者何？爲僖公作主也。主者曷用？ 虞主用桑，練主用栗；用栗者，藏主也"。 穀梁傳亦曰："作僖公主，爲僖公主也。 立主，喪主於虞，吉主於練"。 主者何？ 何休公羊解詁云："主狀正方，穿中央，達四方，天子長尺二寸，諸侯長一尺"。 范寧穀梁注與何說同，但又云："主者神所馮依"：是主卽神主，示之爲言宗廟神主也。 曲禮："天王崩，告喪曰：天王登假；措之廟，立之主，曰帝"。 是帝甲見周語 帝乙見左傳 亦先王廟號，猶主壬之稱示壬，主癸之稱示癸，所以尊先王之鬼若天神矣。 顧卜辭所見，不獨主壬主癸之稱示也。

口亥卜，貞，三示，御大乙大甲且乙五牢。 戩壽堂所藏殷虛文字考釋九葉引羅氏拓本。

己丑卜，大貞，於五示，告丁，且乙，且丁，羌甲，且辛。 甲骨文斷代研究例引孫氏拓本。

董彥堂先生甲骨文斷代研究例謂："丁卽武丁，祖乙卽小乙"，羌甲郭沫若先生謂卽沃甲；是太乙，太甲，祖乙，武丁，小乙，祖丁，沃甲，祖辛，殷人並尊之爲示。且示各一人，人各依於殷本紀之世次，是示之爲號，更寓有世次之意。 史記述殷之世次曰：

殷契母曰簡狄，爲帝嚳次妃。 契卒，子昭明立。 昭明卒，子相土立。 相土卒，子昌若立。 昌若卒，子曹圉立。 曹圉卒，子冥立。 冥卒，子振立。 振卒，子微立。 微卒，子報丁立。 報丁卒，子報乙立。 報乙卒，

子報丙立。 報丙卒，子主壬立。 主壬卒，子主癸立。 主癸卒，子天乙立，是爲成湯。 湯崩，太子太丁未立而卒，于是迺立太丁之弟外丙，是爲帝外丙。 外丙崩，立外丙之弟中壬，是爲帝中壬。 中壬崩，伊尹乃立太丁之子太甲，稱太宗。 太宗崩，子沃丁立。 沃丁崩，弟太庚立。 帝太庚崩，子帝小甲立。 小甲崩，弟雍己立。 帝雍己崩，弟太戊立，稱中宗。 中宗崩，子帝中丁立。 中丁崩，弟外壬立。 帝外壬崩，弟河亶甲立。 帝河亶甲崩，子帝祖乙立。 祖乙崩，子帝祖辛立。 祖辛崩，弟沃甲立。 帝沃甲崩，立沃甲兄子祖丁，是爲帝祖丁。 祖丁崩，立沃甲之子南庚，是爲帝南庚。 南庚崩，立祖丁之子陽甲，是爲帝陽甲， 陽甲崩，弟盤庚立。 盤庚崩，弟小辛立。 帝小辛崩，弟小乙立。 帝小乙崩，子帝武丁立。 武丁崩，子帝祖庚立。 祖庚崩，弟祖甲立，是爲帝甲。 帝甲崩，子帝廩辛立。 廩辛崩，弟庚丁立。 帝庚丁崩，子帝武乙立。 武乙震死，子帝太丁立。 太丁崩，子帝乙立。 帝乙崩，子辛立，是謂帝辛，天下謂之紂。

以卜辭證之，其廟號及世系，不免稍有傳誤。 廟號之誤者，如：曹圉當爲王吳，雍己當爲中己，河亶甲當爲戔甲，沃丁沃甲當爲羌丁羌甲皆郭沫若說，此以音近而譌也。 王振當爲王亥，報丁，報乙，報丙當爲匚匚匚，主壬主癸當爲示壬示癸，外丙外壬當爲卜丙卜壬，庚丁當爲康丁，武乙之子太丁當爲文丁皆王國維說，中壬當爲南壬 董彥堂說，此以形近而譌也。 世系之紊誤者，如：匚，匚子也，而誤爲上甲子；祖乙，中丁子也，而誤爲河亶甲子；王亥之後紊王恆，祖庚之前紊祖己 董說：凡此，不能謂非史公之闕失。 綜所匡正，殷之世系，當如下表：

計自帝嚳至於帝辛，其先公先王凡四十七人，歷世三十有一。　由祭法說，“殷人禘嚳而郊冥，祖契而宗湯”，　魯語說“上甲微能帥契者故殷人報焉”，則殷人禘，袷，殷祭，必自帝嚳始。　顧卜辭所紀，自嚳以下至於王亥王恆，但有分別賁祭之占，不見列於殷祀之典，而其殷祀，皆始自上甲。　如王國維殷禮徵文殷祭篇所引：

辛已卜，貞，王賓上甲衩至於多后，衣。　前編卷二，第廿五葉。

癸丑卜，貞，王賓自上甲至於多后，衣，亾尤。同上。

癸未，王卜貞，酒，肜日，自上甲至於多后，衣，亾它，自口，在四月，隹王二祀。　前編卷二，第廿七葉。

丁酉卜貞，王賓，口自上甲，至於武乙，衣，亾尤。　後編上，第二十葉。

衣，王君讀爲殷，云：“殷爲合祭之名”。　合祭者，禘祫也。　殷人禘祫，不始帝嚳，而自上甲，頗疑殷人卽以上甲爲祖，非祖契也。　魯語所謂報上甲者，當爲殷上甲之誤。　自上甲至於武乙，以先王計，凡三十四君；以世系論，不過二十；卜辭有曰：

癸卯卜，酒，𣪊，貞，乙已，自上甲廿示，一牛；二示，羊，土尞；三示，彘

牢；四示，犬；缺。 戩壽堂殷虛文字第一葉。

然則"自上甲至於武乙，"卽此"自上甲廿示，"是禘祫之典，以世列升，不以先王人數計，示之爲言世也。 董彥堂先生嘗"疑廿示皆大宗，二示，三示，四示，皆小宗"，詳甲骨文斷代研究例 細繹卜辭，則董以廿示爲大宗，甚是；其疑二示，三示，四示，皆小宗，則非。 凡後世宗法所謂大宗者，卜辭皆謂之大示，小宗謂之小示，如：

甲午卜，賓貞，王臨大示。 前編三，第廿二葉。

貞御自上甲，王臨大示。 同上書葉。

貞叀子漁𢍏於大示。 後編上，第廿八葉。

上缺 翌辛，卯一牛，小示；大示，卯宙羊。 殷虛卜辭六版。

乙未貞，其𠦪自上甲十示又三；小示，羊。 後編上，第廿八葉。

由"卯一牛小示，大示卯宙羊"，證"自上甲十示又三，小示羊"。 可知卜辭凡所謂示，皆大示之省稱。 但有辭云：

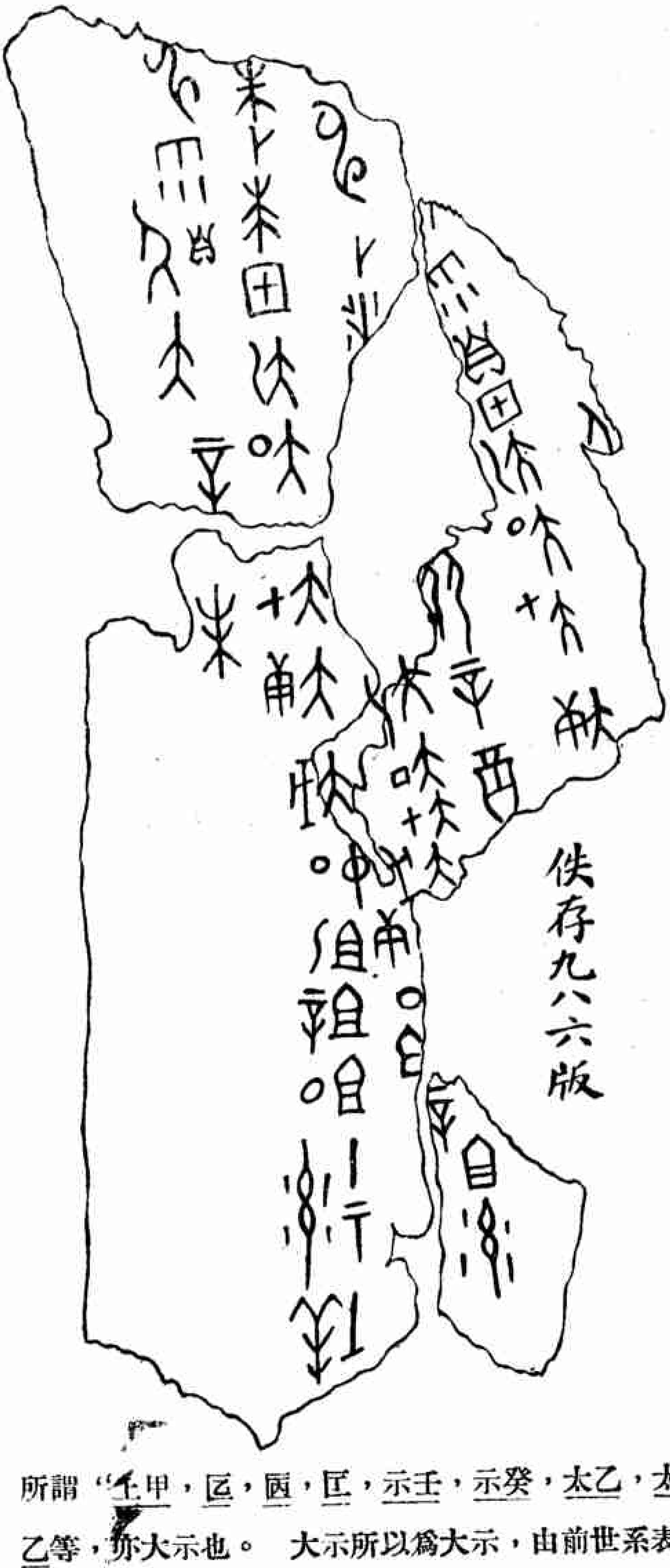
口丑卜，其㚇日 缺 大示三，五示二，十示又 下缺。 殷契佚存八八二版。

辛巳卜，大貞之自上甲元示，三牛；二示，二牛；十三月。 前編三，葉廿二第。

貞勿元示。 同上書葉。

以二示證五示，以元示證大示，可知"自上甲廿示一牛，二示羊，三示𢦔牢，四示犬"，廿示之下，蓋有省文。 其辭當曰："自上甲廿示，元示一牛，二示羊"，所謂："二示，三示，四示"，猶他辭云："大示，五示，十示又口"，五示，十示又口，不能解以小宗；則二示，三示，四示，亦不得謂爲小宗矣。 知二示，三示，四示，五示，十示又口之非小宗小示也，則：

所謂"口未卜𡆥上甲 大乙，大丁，大甲，大庚，大戊，中丁，祖乙，祖辛，祖丁，十示，𡆥牡"， 此十示者皆爲大示。 卽董彥堂先生及王國維所共拚合之殘骨：



佚存九八六版

後編上第八葉

戩壽堂所藏第一葉

劉善齋藏二七·

所謂"上甲，匚乙，匚丙，匚丁，示壬，示癸，太乙，太丁，太甲，太庚，因國，國团，祖乙等，亦大示也。 大示所以爲大示，由前世系表審之，蓋皆身死而子繼也。太丁太甲之間，不序卜丙南壬，明太甲爲太丁子，卜丙南壬皆閏位；太甲太庚之間，不序芍

丁；大庚大戊之間，不序祖己小甲；中丁祖乙之間，不序卜壬戔甲；祖辛祖丁之間，不序芎甲；亦以明太戊爲太庚子，芎丁爲閏位，祖乙爲中丁子，卜壬戔甲皆閏位，祖丁爲祖辛子，芎甲爲閏位；閏位者不序於大示，則大示之意，但示其身所自出，不問其父比於諸父之長幼，與公羊傳所謂："立適以長不以賢，立子以貴不以長" 隱公元年者，大相違異。 然則殷人示法，不以長幼等貴賤，但以子能繼父者爲最尊，其名爲大示，其實卽大宗。 大宗者，宗其身所自出也。其非身所自出者爲閏位，爲小示，卽爲小宗。 小宗，亦上甲太乙子孫也。 不得與於大宗股祭，遂不得謂無合祭之時，當其合祭，只及卜丙南壬芎甲小甲中己卜壬戔甲芎甲，而不及上甲大乙，是無祖矣。 上甲太乙，既在大宗，又在小宗者，蓋以其爲大宗之祖，亦爲小宗之祖，王者禘其祖所自出，非宗法之無定也。

殷之宗法，宗其身所自出者爲大宗。 大宗所宗，不獨先祖而已也，卽先祖之妣亦皆予配享。 如甲骨文斷代研究所引：

庚辰卜貞，王賓示癸，奭妣庚，翌日，亾尤。 後編上，第一葉。

甲子卜貞，王賓示癸，奭妣甲，口亾尤。 同上葉。

丙寅卜貞，王賓大乙，奭妣丙，翌日，亾尤。 同上葉。

戊戌卜貞，王賓大丁，奭妣戊，祼，亾尤。 後編上，第二葉。

辛丑卜貞，王賓大甲，奭妣辛，肜日，亾尤。 後編上，第一葉。

壬寅卜貞，王賓大庚，奭妣壬，𠯑，亾尤。 後編上，第二葉。

壬寅卜貞，王賓大戊，奭妣壬，𠯑，亾尤。 同上葉。

癸丑卜貞，王賓中丁，奭妣癸，祼，亾尤。 同上葉。

己巳卜貞，王賓祖乙，奭妣己，肜日，亾尤。 後編上，第三葉。

庚午卜貞，王賓祖乙，奭妣庚，𠯑，亾尤。 同上葉。

庚子卜貞，王賓祖辛，奭妣庚，肜日，亾尤。 同上葉。

己巳卜貞，王賓祖丁，奭妣己，肜日，亾尤。 同上葉。

癸酉卜貞，王賓祖丁，奭妣癸，𠯑，亾尤。 同上葉。

庚午卜貞，王賓小乙，奭妣庚，𠯑，亾尤。 後編上，第四葉。

辛巳卜貞，王賓武丁，奭妣辛，祼，口口。 同上葉。

戊子卜貞，王賓武丁，奭妣戊，祼，亾尤。 同上葉。

癸未卜貞，王賓武丁，奭妣癸，祼，亾尤。 同上葉。

戊午卜貞，王賓祖甲，奭妣戊，祼，亾尤。 後編上，第四葉。

辛巳卜貞，王賓康丁，奭妣辛，口，亾口。 同上葉。

武乙之妣，卜辭未見，𨽍作父乙彝銘可以補之：

戊辰，弜師錫𨽍𩚩戶賚貝，用作父乙寶彝。在十月一，隹王廿祀。 劦日，遘於妣戊，武乙奭。 豕一旅。 殷文存上，第十九葉。

妣號甲者，祭以甲日，號乙者祭以乙日，與祀先王之禮同。 妣下奭字，篆作𡘞𡘞𡘞𡘞𡘞𡘞諸形，羅振玉殷虛書契考釋謂卽召公奭之奭是也。 奭配雙聲，此當讀爲配。 少牢饋食禮："孝孫某來日丁亥，用薦歲事於皇祖伯某，以某妃配，某氏尙饗"，鄭注："合食曰配"，公羊傳："郊則曷爲必祭稷？王者必以其祖配"，宣三年 何氏解詁亦曰："配，配食也，"是"王賓祖口，奭妣口"，卽以妣配享於祖之意。 其非大宗之妣，而得配享者：

己巳卜，行貞，翌午，歲，其𢓊於羌甲，奭妣庚。 殷契佚存八七八版。

惟羌甲之妣妣庚一見。 蓋羌甲雖在小宗，有子南庚嗣之，實同大宗。 尤可證殷之大宗，不在身能繼祖，而在子能繼身。 若夫祖乙之配，有妣己妣庚；祖丁之配，有妣己妣癸；武丁之配，至有妣辛妣癸妣戊三人；郭沫若謂："此乃亞血族羣婚制之孑遺，異姓之兄弟羣與姊妹羣互相羣婚，春秋時諸侯娶婦，猶以同姓姪娣爲媵，卽其半面之存根"。 卜辭通纂考釋第廿七葉可由尸子決其誤。 尸子曰；"殷高宗之子曰孝己，有孝行，其母早死，高宗惑後妻言，放之而死。" 莊子外物亦曰："人親莫不欲其子之孝，而孝未必愛，故孝己憂而曾參悲。" 荀子性惡亦有："孝己獨厚於孝之實而全於孝之名者以綦於禮義"之說。 是孝己卽高宗武丁子，武丁三配，皆由先殂後繼，非如少康二姚，尤非"亞血族羣婚制"也。 殷人果爲"亞血族羣相婚" 時代，不得有妻妾區別，卜辭旣載示壬之配爲妣庚矣。又云：

貞來庚戌之於示壬妾。 鐵雲藏龜之餘四葉。

之于示壬妾妣乙，牝，白豭。 殷契佚存九九版。

是示壬又有妾，其妾卽卜辭數見之妣乙。 妣乙何爲特祀？ 頗疑示癸非妣庚適子，乃

妣乙所出，王者禘其身所自出，故雖妾媵，亦得特祀。 禮記雜記："婦附於其夫所附之妃，無妃，則亦從其昭穆之妾"， 由卜辭證之，妾之配祀，不自周人始。 有妾有妻，卽有適庶，有適有庶，卽有宗法。然則宗法之起，不始周公制禮，蓋興於宗廟制度。 殷之宗廟，以子能繼父者爲大宗，身死而子不能繼位者，雖長于昆弟，亦降爲小宗，與禮家所傳"繼別爲宗，繼禰者爲小宗"， 適得其反。 凡禮家所謂繼別，繼禰，則近於周人之大宗爲祖，小宗爲禰，是後儒相傳之宗法， 卽周宗昭穆之演變，吾故曰，宗法者，辨先祖宗廟昭穆親疏之法也。

廿三年一月初稿，四月修訂於青島山大。

弋射與弩之溯原及關於此類名物之考釋

徐 中 舒

一 敍言

人類在舊石器時代，卽已利用弓矢。 現存西班牙洞壁刻畫，有持弓矢戰鬥及狩獵諸圖，大約皆一萬五千年以前所遺。 此可見人類利用弓矢，由來極遠。 即現代未開化之民族，亦無有不以弓矢為武器者。 弋射與弩，不過就弓矢上略加簡單機械，以增加其威力；其效果：(1)使射愈遠，(2)中的較準確。 故在未有火器以前，此實為最進步之利器。

弋射與弩在人類文明中當然不若弓矢由來之悠遠，亦不若弓矢流傳之普遍。 其事蓋創始於東方。 商代甲骨文中已有象弓弩矰繳形之文字。 漢以後史書載南方民族未經中國同化以前，即已有弩。 據此而言，弋射與弩其在東方，或尚在殷商以前。 中華民族當三千年前，即已能利用此種最進步之利器，實可驚異。 近代學者對於東方蠶絲，磁器，造紙，印刷，火藥等物之發明，無不盛為稱道；獨於此則尚不詳其所由來。 拙著古代狩獵圖象考曾對此加以詳細之討論，旣付梓後，瀏覽所及，續有所得，復參以北平市上所售之弩，對於前說有足資補正者，因再為此文以述之。

二 關於之矰繳之文字

弋射所用矢，與尋常矢不同。 淮南說山云："好弋者先具繳與矰"； 高誘注：

繳大綸（說文"綸青絲綬也"，"繳生絲縷也"，詩采綠傳"綸釣繳也"，知綸繳均是細絲繩）矰短矢，繳所以繫者，繳射，射注飛鳥。

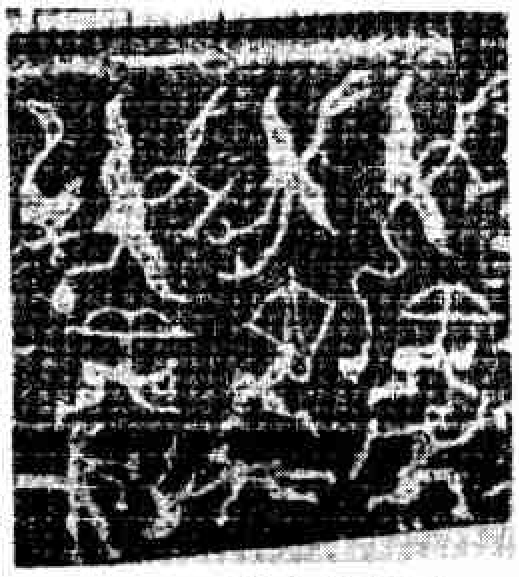
此說弋射所用矢最為詳明。 周禮司弓矢云："田弋，充籠箙矢，共矰矢"，注云：

籠竹箙也，矰矢不在箙者，為其相繞亂，將用乃共之也。

此謂矰矢繫繳，故不在箙中，亦明其與尋常矢異。 銅器四耳盂所繪弋射形，矢皆繫長繳。 甲骨文有弗，叔，弔，及從夷之雉，隩諸字。 弗，叔，弔，夷疑即象矰

矢繫繳形。

弗	弗	叔	叔	弔	雉	陝
前二·三七	前六·一一	前五·一七	前三·三二	後下十三	後下六	前七·三二



四耳盂所繪弋射形圖

茀原爲弋射所用矢名，周禮司弓矢云："矰矢茀矢，用諸弋射"。甲骨文茀又從矢倒置，更爲此說旁證。 弔與鏑本同音字，疑弔即鋒鏑之本字。 弔至也，至銅器作𡉀，象矢鏃倒立著地形，義亦相因。 叔善也，即至引申之義。 古叔弔二字多通用，甲骨文弗叔連文，弗叔即不淑，詩節南山"不弔昊天"，瞻卬"不弔不祥"，左氏昭二十六年傳"率羣不弔之人"，哀十六年傳"昊天不弔"，凡此不弔諸文，均當作不淑。 據此知叔弔形近義通，故得通用。 雉甲骨文從夷，夷象矰繳形（說文夷從大從弓，說誤，）古代弋原爲射飛而設，鄭玄月令注"弋射飛也"，詩女曰雞鳴"弋鳧與鴈"，論語述而"弋不射宿"，皆射飛之證，故雉字從夷。 陝甲骨文人名，義不詳。 以上諸字，其繳形作己，尤與四耳盂所繪繳形相似。 比合而觀，其爲繳形已甚顯然。 又銅器兄弟之弟從弋從己（說文"弟韋束之次弟也，從古文之象……古文弟從古文韋省，"已不知弟字所從之形，）凡弋射之繳，必有條理次弟而後始能及遠，故凡從己之字，皆有條理次弟義，如紀綱記述皆是；弟從己，故亦有次弟義。 弟引伸爲兄弟字（釋名"弟弟也，相次弟而生也"）與叔引伸爲叔爲伯字，義亦全同。 高誘注"繳大綸"，從侖之字亦有條理次弟義，如倫理經綸皆是。

殳季良父壺　虘殷　應公鼎　齊鎛

據此而言，甲骨文中從己諸字，皆當象繳之形。 弟又從弋，是己爲弋射之繳，更可無疑。 從而商之有弋射，已可由文字上完全證明之。

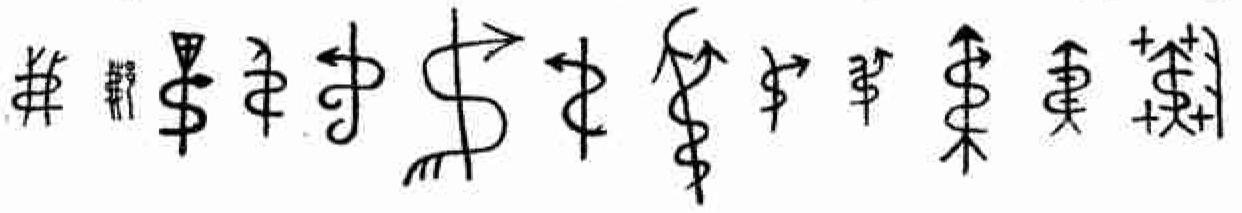
甲骨文又有從弓諸字，其字今皆不可識。 其偏旁弓亦象矰繳形。 此諸字中有從弓者，

前一·三〇　前五·四　前六·三六　前六·三六　前六·一四　又前四·四三　前二·四　續一·一　後下二九　後下三　後下二二　前一·四七

如□□，尤象弋射形。 有從犬者(□)，有從畢者(□)，亦皆田弋所有事。

弗弔叔夷陳諸字亦見於銅器中。 弗從弋甚明，又觚文及弔父辛觚，兩弔字己形之末作三歧或兩歧形，尤與繩形相似。

1弗　2郝　3—7弔　8—10叔　11—12夷　13陳



叔皮父敦　墾文　弔龜爵　弔龜段　段文　觚文　弔父辛觚　叔倉父盨　敓叔段　啟鼎　仲夷尊　守段　父辛盤

說文"徽一曰三糾繩也"，易"係用徽纆"，劉表曰："三股曰徽，兩股曰纆"，御覽引通俗文云："合繩曰糾"，此三歧兩歧，即象繩三合或兩合之形。 甲骨文申字，其兩端亦象繩兩合之形（銅器申形同，從略）。 古申在眞部，繩在蒸部，蒸眞古可通協，如詩文王末章躬與天協是，申蓋即繩之本字。 故由申之本義言之，上舉諸字之象矰繳形，更爲顯然。

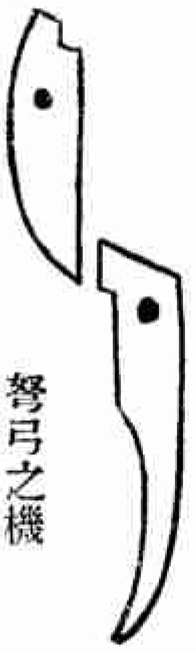
前一·五　前二·二七　前三·三　前三·四　前三·六　前三·六　前三·二四　前七·四〇

三　北平市上流行之弩

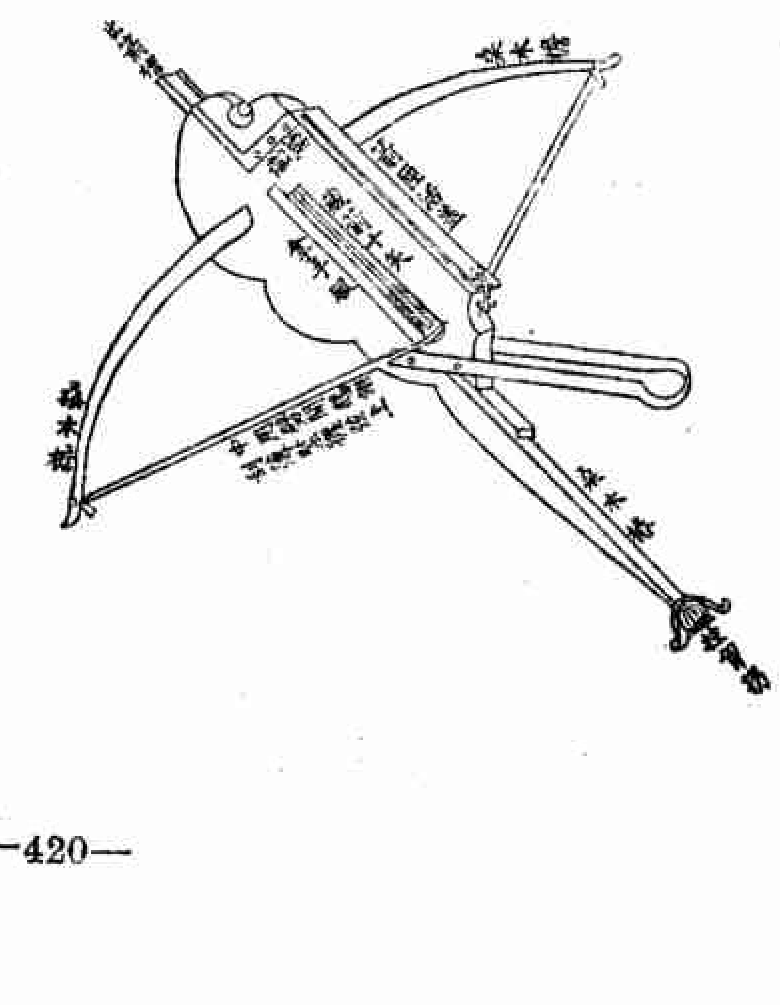
弋射之與尋常弓矢不同者，不但其所用之矢不同，即所用之弓亦異。 弋射所用之弓，有臂有機，當名爲弩，已詳拙著古代狩獵圖象考（見史刊外編蔡孑民先生六十五歲紀念論文集下册。） 此有臂機之弩，現在北平市上仍有售者。 其製可別爲兩種，一爲發彈

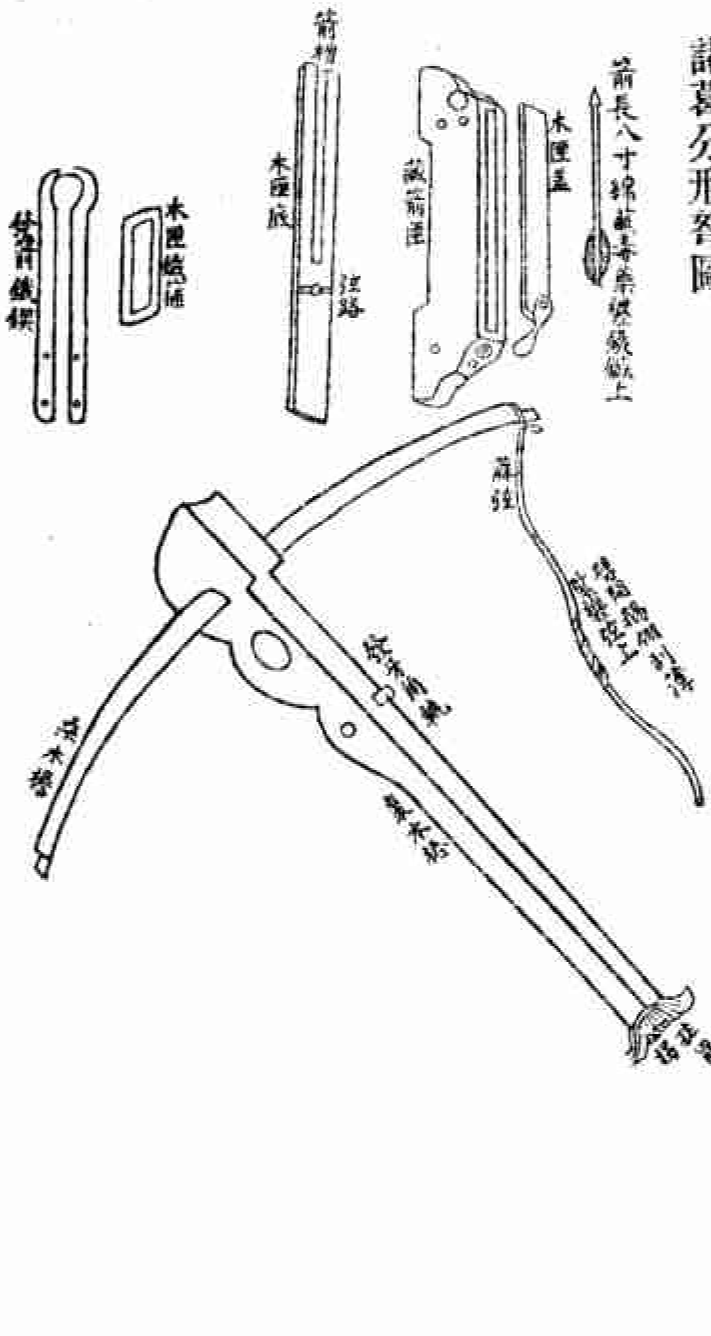
用之弩，俗名弩弓(圖版一)。一爲連續發十彈或十矢之弩，俗名彈弩或連珠弩(圖版二)。

弩弓具一曲臂，臂上有弓與機。弓與機外，弓之前端有粗鐵絲製長方形架，架上橫繫一線，線上繫一小珠，架俗名星架，珠曰準星。又機之後端立一竹牌，牌中鑿一小孔，牌俗名斗牌，又名星牌。準星之地位，先可上下左右移動，待至由斗牌小孔中以窺準星，與所射成一直線發即命中時，即固定之，以爲射擊標準。機用銅製，分上下兩段上與古弩機之牙相當，用以鈎弦，下與古弩機之懸刀相當，用以發機。弦用牛筋製，中有斗，斗前端用以銜彈，後端用以鈎於機牙上。


弩弓之機

彈弩或連珠弩，直臂，臂上置一匣以盛彈或矢（如匣增大，則發彈或矢之數亦可增多）匣近臂處留一弦道，弦道之後端向下微凹以爲銜弦之用，機牙係一長方形小骨片，即置於此凹處，可自向上下移動。匣與臂相連之關鍵，一端藉弦通過弦道之力，一端別有一柄，俗稱爲拐子（古當稱曰樞，）夾於匣與臂之兩旁，兩鍵貫之，一鍵在匣，一鍵在臂。用此弩時，先置彈或


諸葛全弩圖


諸葛分形弩圖

矢於匣中，然後將拐子向前轉動，待弦落於弦道後端凹處，則將拐子向後轉動，當轉動時，匣之後端與臂並不緊接，待匣與臂緊接時，則牙為臂所阻而上升，因而將弦擠出凹處以發彈或矢，如此往復轉動，則彈與矢即連續發射不已。　明茅元儀武備志載諸葛弩形製全與此同，茲並將原圖，迻錄於此，以爲參考。

以上兩種弩製，雖爲現今北平市上流行之物，但其來源有極古者，下文當就文字方面爲證明之。

四　關於弋射之文字

銅器弋及偏旁從弋者，有弋妣杙必叔鈛庚逘諸字，據此諸字以與弩之形製相較，知卞爲最初象形字，𠂇爲漸次譌變之形。　卞中直象弩臂，長橫象弛弓形，短橫疑與弩弓上準星之用相當，疑古名此爲式，或度，亦謂之儀表。

農卣　叔妣殷　生杙姜殷　寰盤　吳尊　大克鼎　陳侯午殷　璽文　曾逘伯鼎

古弩射有參連法，其見於記載者如：

大黃參連弩。——六韜軍用篇

夫射之道，從分望敵，合以參連。——吳越春秋九勾踐陰謀外傳

不知公子王孫，左把彈，右攝丸，定操持，審參連。——新序雜事

五射……二曰參連，……——周禮保氏注

寵射，其祕法以天覆地載，參連爲奇，又有三微三小，三微爲經，三小爲緯，經緯相將，萬勝之方，然要在機牙。——後漢書孝明八王（陳王寵）傳注引華嶠書

此參連法注家多不解，今但取弩弓之製觀之，則此法乃極易曉。　據前所述用弩弓時，由斗牌或星牌之小孔中以窺準星，與所射，三點相連成一直線時，則發射即可命中，是參連者即射擊瞄準之法。　參古多借爲三，華嶠書三微三小，當即釋參連之參。　所謂微小者，如弩弓斗牌之孔，及準星之珠，皆極微小。　又三微爲經三小爲

緯者，如以準星之珠爲經，則懸珠之線即緯，同例則斗牌亦有一經一緯，其他一經一緯，當謂所射之物。 後漢書孝明八王傳謂陳王寵善弩射，十發十中，中皆同處，蓋必有此精密之瞄準法，而後始能如此。

以上所引諸書皆出東漢以後（六韜題太公作，胡應麟四部正譌云：「六韜稱太公，厥僞眎然，攷漢志有六弢初不云出太公，蓋其書亡於東京之末，魏晉下談兵之士，援拾剩餘爲此，即隋志六韜）但參連法之興起或遠在此時以前。 禮記緇衣引逸書太甲云：“若虞機張，往省栝於厥度，則釋”， 鄭玄釋之云：

虞主田獵之地者也，機弩牙也，度謂所以射也，虞人之射禽，弩已張，從機間視栝，與所射參相得，乃後釋弦發矢。

所謂參相得者即栝度與所射三者相得。 釋名矢末曰栝。 從矢末視度，則古弩射僅有與準星相當之度，而無斗牌，故以栝代斗牌之用。 度者法度，蓋準星即射之法度，亦謂之儀表。 吳越春秋卷九云，“願聞望敵儀表，投分飛矢之道”；儀有法度之意，表晉語十四韋注云：“立木以爲表，表其位也”；立木表位，正象弋字右旁之短畫。

儀表又名式，儀爲法度，式亦有法度意，式又從弋聲，疑即其本字。 詩楚茨云：“如幾如式”，傳云，“幾期，式法也”， 古譬況辭多舉易見之事，易曉之物，如云，“如匪行邁”，“如彼築室於道謀”，“如履薄冰”，“其人如玉”，“如茨如梁”等是，此“如幾如式”，若如毛釋“如期如法”，則說極難曉。 余疑幾即弩機之機，式即與準星相當之度或儀表，下文云：“既齊既稷，既匡既敕”； 齊稷有疾速意，匡敕有正中意，如幾故疾，如式故正，義實相因。

度之爲式，更有旁證二：說文“軾車前也”，軾在車前，式亦在弩前。 旁證一。史記日者傳云：“旋式正棊”，索隱云：

式即栻也，旋轉也，栻之形上圓象天，下方法地，用之則轉天綱，加地之辰，故云“旋式”。

卜用之栻，今樂浪有出土者，其製合方圓二者而成。 弩弓之星架形方，準星形圓，合之亦當名式。 華嶠書謂寵射其祕法以天覆地載參連爲奇，古謂天圓地方，所謂天覆地載，或即指此。 旁證二。

甲骨文有于字而無弋及從弋之字，于甲骨文作于，亦有作玗者（早期銅器于亦作

⿰于戶）。 余疑于與弋同，均象弩形，特於所象之式更較弋為長。 于又作⿰于戶者，于既象弓臂與式，戶更示其為曲臂。

前一·四　前一·四三　前一·五三·　前二·二·　前八·一四·　前八·一·　前八·六·　菁一一·　後下·四一　後下·四三·

爰從于從𠬪，說文"𠬪上下相付也，"謂象兩手上下相付之形；余疑爰之從𠬪，乃象兩手引弓弩形，故爰得訓為引。 又古謂張弓引弓曰扜弓（扜或作弙）：

弙滿弓有所鄉也。——說文

管仲扜弓射公子小白中鉤。——呂氏春秋貴卒

扜弓而射之。——呂氏春秋壅塞

鴻鵠在上，扜弓鞞弩以待之。——藝文類聚引尸子

有人方扜弓射黃蛇。——山海經大荒南經

射者扜烏號之弓。——淮南原道

弩臂亦謂杅：

惠子曰："羿執鞅持杅操弓關機，越人爭為持的"。——韓非子說林下

鞅，杅，弓，機，四者皆弩所有事（春秋趙鞅字志父志者盤庚上云："若射之有志"，名鞅字志，疑鞅即弦之中央處，故得與志義相應）。 杅可持，故知為弩臂。 又弩臂曲，故從于之字如紆迂有迂曲義。 以上所述于之為弩，說如不誤，則殷商之世已用弩射，而弩射之興，必尚在殷商以前。

銅器從弋者尚有必叔鉄庚𢦏數字。 𢦏為人名，義不詳。 叔與伯叔之叔，在銅器截然有別。 銅器從弋之叔如：

易錫女汝叔市巿參同䒑心惠。——大克鼎：

易女叔市金黃。——師嫠殷

册命吳𤔲旜眔叔金。——吳彝

市為蔽膝，詩作芾，或韠，禮記玉藻作韍。 玉藻"一命緼韍幽衡，再命赤韍幽衡，

三命赤韍蔥衡"； 據此知叔市即指市之顏色言，或與玉藻之緼韍相當。 與彝"叔金"亦指顏色言（師嫠𣪕叔市金黃，叔金皆指顏色言，黃衡同字，又作珩）此皆與弋射無關。

必從弋，余舊以為象末形（見耒耜考）說誤。 必者當為柲之本字。 考工記廬人"戈柲六尺有六寸"；注"柲猶柄也"。 柲之為柄，當為弩臂引伸之義。 儀禮既夕記"明器之弓有柲"；注以為即詩小戎"竹閉緄縢"之閉（注引閉作柲）：

柲弓檠也，弛則縛之於弓裏，備損傷也，以竹為之；詩云"竹柲緄縢"，今文柲作柴。

又考工記弓人"辟如終紲"注以紲為閉（注引作韘）：

紲弓韘……弓有韘者，為發弦時備頓傷：詩云"竹柲緄縢"。

注並以柲紲為弓檠，檠正弓弩之器，又有排檠榜檠輔檠諸稱：

繁弱鉅黍古之良弓也，然而不得排檄，則不能自正。——荀子性惡

彼十鈞之弩不得棊檄，不能自正。——管子輕重甲

烏號之弓雖良，不得排檄，不能自正。——說苑建本

榜檄者所以矯不正也。——韓非子外儲說右

若隱栝輔檄之正弧剌也。——鹽鐵論申韓

柲閉排榜輔古邦滂並母，同為唇音字，故得相通。 弓檠名柲，當亦由有柄得名。

鉠庾之偏旁臾，古與曳無別（說詳拙著陳侯四器考釋）說文於臾曳字形並失，而釋之云：

臾，束縛捽抴為臾曳（曳從段注補）。

曳，臾曳也。

臾曳字從弋，故弓弩得名庾（字又作臾）周禮司弓矢六弓四弩，有夾，庾，唐，大諸稱；考工記弓人"夾臾之屬利射侯與弋"；皆弓名臾之證。 許謂束縛捽抴者，臾曳從弋從⊖，⊖疑即象束縛弓弩形。 又弓弩可以引張，故臾曳有捽抴義。 又從曳之字多與從世之字通用，如抴或作拽，枻或作栧，洩或作泄，絏或作紲，故紲（或枻）之為弓檄，當即由曳通假得義。

五　弩機與樞機

弩所用機可別為兩類：(1)弩機，(2)樞機。

弩機銅製，今出土者極多，其構造大致均相同。　釋名釋兵云：

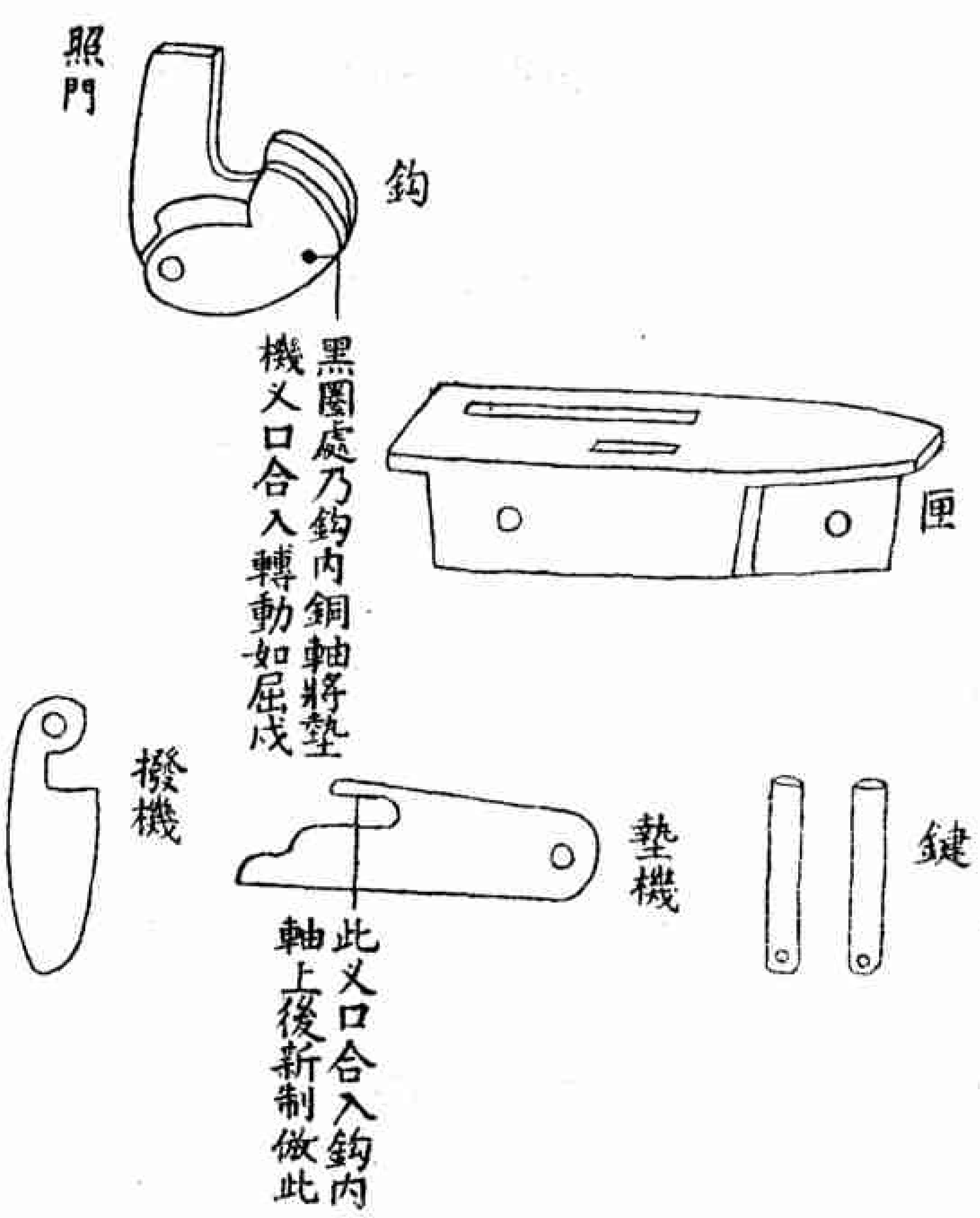
> 弩怒也，有埶(勢)怒也，其柄曰臂，似人臂也，鉤弦者曰牙，似齒牙也，牙外曰郭，為牙之規郭也，下曰縣刀，其形然也，合名之曰機，言如機之巧也，亦言如門戶之樞機，開闔有節也。

此文論機之結構特詳(自鉤弦以下皆謂機)茅元儀武備志載有法古制銅弩機散圖，其各部分名稱，據同書法古制銅弩機散圖說云：

> 今曰機鉤，古曰牙，今曰照門，古曰規，今曰匣，古曰郭，今曰撥機，古曰縣刀，今曰墊機，古無名。

規釋名統謂規郭，文選潘岳射雉賦云：“良遊阨喔，引之規裏”；徐爰注“誘引令入可射之規內”；即此所謂規，沈括夢溪筆談卷十九稱之為望山。　此諸名稱，與吳越春秋所載又互有同異。　吳越春秋句踐陰謀外傳云：

法古制銅弩機散圖



越王曰：'弩之狀何法焉"？陳音曰："郭爲方城，守臣子也；教爲人君，命所起也；牙爲執法，守吏卒也；牛爲中將，主內裹也；關爲守禦，檢去止也；錡爲侍從，聽人主也；臂爲道路，通所使也；弓爲將軍，主重負也；弦爲軍師，禦戰士也；矢爲飛客，主教使也；金爲實敵，往不止也；衛爲副使，正道里也；叉爲受教，知可否也；縹爲都尉，執左右也；敵爲百死，不得駭也，鳥不及飛，獸不暇走，弩之所向，無不死也。臣之愚劣，道悉如此。

此舉弩及矢之各部分名稱極詳，曰臂，曰弦，曰郭，曰牙，與釋名同。曰教即武備志所謂照門，古所謂規。此文言教者三：(1)教爲人君，命所起也；(2)矢爲飛客，主教使也；(3)叉爲受教，知可否也；此與前述禮記緇衣鄭注"機間視栝……參相得乃後釋弦發矢"語，可互爲證明。鄭謂機間即教，鄭謂栝即叉（釋名釋兵云"栝會也，與弦會也，栝旁曰叉，形似叉也）由教視叉，然後發矢，故教爲人君，叉爲受教，矢爲教使。關釋名謂之懸刀。牛疑即武備志之鍵，機必有鍵，始可轉動開闔，鍵者內部之樞紐。牛古之部字，紐古幽部字，漢人韻文之幽部字多通協，又十二支之丑爲牛，故牛紐得相通。錡張衡西京賦云："武庫禁兵，設在蘭錡"；李善注：

錡架也，武庫天子主兵器之官也，善曰："劉逵魏都賦注曰，'受他兵曰蘭，受弩曰錡'"。

錡爲架弩之用，故爲侍從。矢爲飛客以下統皆謂矢。金爲鏃。衛爲羽，釋名"矢其旁曰羽，齊人曰衛"。縹疑即榦，釋名"矢其體曰榦，言挺榦也；"榦又名槀，周禮槀人"箭榦謂之槀"，古縹槀同爲宵部字，故得相通；縹爲榦，故可執以左右。據此所述，弩機之用大致即與今平市所售之弩弓同。弩弓所用之機有牙與懸刀，其郭即就臂鏤空爲之，其規即以斗牌代之，其主要部分無不與古弩機同。余疑此即原始弩之遺存者。出土弩機所以無戰國以前物者，其故亦可推知；即此種簡單弩機，易爲人所忽略，或此期弩機尙無用銅製者。說文"橜弋也，"朱駿聲注云："凡豎木而短者皆得曰橛；謂豎木而短，正象機在臂上之形；疑即木製之機。或以角爲之，字又作𧣾，說文"𧣾角有所觸發也；謂有所觸發，正象發機時之動作。茅元儀武備志載明代弩機，仍多以鹿角爲之：

今四方擅弩之地，而皆不用古機，惟以鹿角爲機。

此當即因仍原始弩機之舊習。　釋名謂機牙似齒牙，蓋原始弩機以角骨爲之，角骨似齒牙，故謂之牙。　及戰國之末，競爲爭戰，弩機之製漸趨完善，然狩獵所用，或仍保存原始形製。　唐宋以來古戰陳用之弩機既已不傳，而此狩獵用之弩機如今之弩弓者，或得保存於今。　蓋現代人類用具之保存數千年以前之形製者，所在多有，如近代火車輪船盛行之後，而大車帆船仍沿用不廢，其製亦與數千年前無異。

樞機之構造，全與弩機不同。　前人皆知有弩機，而不知有樞機。　古書言樞機者，注家多釋樞爲戶樞：

言行君子之樞機，樞機之發，榮辱之主也；釋文"樞門臼，又引王廙注樞戶樞"。——易繫辭

言如門戶之樞機，開闔有節也。——釋名釋兵

此因歷來注家僅知有戶樞，而不知有樞機，故凡言樞機者皆誤謂戶樞。　易繫辭云："樞機之發"，凡言發者，絕不能指爲戶樞。　古謂機或發機，皆指弩射言，如：

若將有大寇亂，盜賊將作，若機辟將發也。——墨子非儒下

其發若機栝。——莊子齊物論

勢如彍弩，節如發機。——孫子勢篇

鴻鵠在上，扜弓韝弩以待之，若發若否。——尸子（藝文類聚引）

其用之也若發機。——淮南原道

說文"機，主發謂之機"，亦指弩射言。　段注謂機爲織具，織具不能主發，其說誤。　新序善謀云："樞機之發，間不及旋踵"；此樞機决不能釋爲戶樞，釋爲織具。　吳越春秋卷九陳音論弩之原起云：

琴氏以爲弓矢不足以威天下……乃橫弓著臂，施機設樞，加之以力。

此樞機明指弩射而言。　鬼谷子飛箝云，"料氣勢爲之樞機以迎之隨之"；樞機可迎可隨，亦當指弩射言。　余以今平市所售之彈弩，或連珠弩，即古樞機之遺製。　管子樞言注云：

樞者，居中以動外，動而不窮者也。

此謂樞猶如幾何學上之作圓。　凡作圓必取一中點以爲圓心，凡圓必可轉動不窮，故

樞有中樞義，有戶樞義。　今彈弩所用之拐子，於臂上取一中點，而向前後轉動之，其作用與樞之含義全同。　故此當名為樞，合匣上之機牙言之，則當名為樞機。　樞機之名稱，據上所述，見於易繫辭新序吳越春秋鬼谷子諸書皆為漢人所作。（東漢末年，釋名之作者劉熙，已不識樞機。）　繫辭舊稱孔子作（見史記漢書論衡諸書）其說全不足據（參看古史辯第三册），余意此書當出漢人手筆，茲取兩事論之：(1 西晉時出土之汲冢書，有周易上下篇（即卦爻辭）而無繫辭：

（汲冢書）周易及紀年最為分了，周易上下篇與今正同，別有陰陽說而無彖象文言繫辭——杜預春秋經傳集解後序

其易經二篇與周易上下經同，易繇陰陽卦二篇，與周易略同，繇辭則異，卦下易經一篇，似說卦而異。——晉書束皙傳

汲冢書之紀年迄於今王之二十年，今王即魏哀王（說見拙著陳侯四器考釋）是汲冢書當為魏哀王時物（即元前三世紀）。　據此可見繫辭必出於此時以後，(2)先秦人著作中常稱引周易，但無引用繫辭之文句。　引用繫辭者多見於西漢人書中，如史記太史公自序，漢書武帝詔，劉向歆書表，王莽詔書，韓詩外傳鹽鐵論桓譚新論等（新語新書亦引繫辭，疑非陸賈賈生書）據此則繫辭當出於戰國以後，西漢中葉之時。　繫辭既為西漢時書，新序舊題劉向作，向亦西漢人，吳越春秋舊稱趙曄作，曄東漢人，鬼谷子亦漢人偽書，是樞機或即興於西漢之際。　惟今之彈弩可連續發十矢或十彈者，或出於後來損益增改而成。　明人謂彈弩為諸葛弩，俗稱諸葛皆指諸葛亮言。　三國志諸葛亮傳注引魏氏春秋云：

亮……又損益連弩，謂之元戎，以鐵為矢，長八寸，一弩十矢俱發（藝文類聚弩部引戰國策曰“；蘇秦為楚合從，元戎以鐵為矢，長八寸，一弩十矢俱發”；其文全襲用魏氏春秋，今本戰國策亦無此語，當係誤引）。

今之彈弩是否即諸葛遺製？據魏氏春秋所述，有可疑者二：（1）古之連弩，似不用樞機，墨子備高臨篇述連弩之車，有“以弦鈎弦至於大弦”之語；淮南氾論訓注“連弩通一弦，以牛挽之，”文選閒居賦引漢書音義張晏云“連弩三十絭共一臂；”似連弩者，通許多弓弦於一大弦，而以牛或人挽之。　亮所損益者，如為古連弩，則非樞機可知。　（2）一弩十矢俱發，應解為一發十矢，而非連續發十矢，此亦與樞機之發射不

同。 據此諸葛弩之名，或後人據魏氏春秋十矢俱發之文，傅會而成。 此彈弩雖非諸葛遺製，然其鉤弦發矢，極見機巧，"卽懦夫閨婦，皆可執以環守其城"，（本武備志諸葛弩圖說語）此必非原始之樞機，其爲後來損益增改而成，蓋可無疑。

六 弩之名稱及其由來

藤田豐八支那刻石之由來（見東洋學報十六卷二號，又東西交涉史南海篇）疑中國之弩源出印度。 據藤田之意見，以爲當元前四世紀時，印度人已用弩從事於戰爭，其用弩之方法，與中國古代所謂蹶張相同。 又梵言弓爲 dhanu，亦與弩之名稱相似。 史記蘇秦傳韓國所產之名弩谿子，注家以爲谿子卽南方蠻夷；故中國之弩當由印度傳入南方蠻夷，復由南方蠻夷以傳入中國。 拙著古代狩獵圖象考曾就兩方之記載加以比較，以爲中國之有弩遠在元前四世紀以前，絕不能遽斷其由印度輸入；至弩之名稱，始見於戰國時人著作中，卽元前四世紀之記載，兩方年代適不相先後，或卽由印度輸入。 此說前者謂中國之弩不能斷其由印度輸入，由上文所述諸端觀之，已可證明其說之不誤。 至於後者謂弩之名稱或由印度輸入，立論未免疏忽。 今並當於下文中詳論之。

弩之名稱曾見於西周銅器中。 茲將此器銘文揭載於此，並釋之云：

> 隹惟正月甲午，王才在𩁹居，王親令命白𩓞曰："毋卑俾農弋，吏使𠂤厥友妻農"。 迺稟𠂤𢦏，𠂤小子小大吏事毋又田。 農三拜䭫首，敢對陽揚王休從。

此器銘文及器形曾載於周金文存卷五中。 由其銘文之字體及器之形製紋樣觀之，可斷爲西周中葉時物。 銘文以弋𢦏田並言，𢦏又從弋（拓本偏旁弋左上一小橫畫，不甚清

斷）知爲弋射之弩。　稟者倉廩，倉廩所以藏穀，疑稟有藏義（說文"繳雖射所蔽者也"；段注"此卽射雉之翳也，亦謂之廩，廣雅廩作篠"；按韓非子外儲說右上有弋者謹廩之言，其義均與此異）。　曰毋俾農弋，曰藏其弩，曰毋叉田，文義正相承。據此在西周時卽已有弩之名稱；是中國關於弩之記載，亦遠在印度以前。

古之稱弩，似不限於有臂之弓。　石矢鏃亦得名砮。　國語魯語云：

仲尼在陳，有隼集於陳侯之庭而死，楛矢貫之，石砮，其長尺有咫。　陳惠公使人以隼如仲尼之館問之，仲尼曰："隼之來也遠矣，此肅愼氏之矢也。　昔武王克商，通道於九夷百蠻，使各以其賄來貢，使無忘職業，於是肅愼氏貢楛矢，石砮，其長尺有咫。　先王欲昭其令德之致遠也，以示後人，使永監焉，故銘其栝曰'肅愼氏之貢矢'，以分大姬配虞胡公而封諸陳。　古者分同姓以珍玉，展親也，分異姓以遠方之職貢，使無忘服也；故分陳以肅愼氏之貢。　君若使有司求諸故府，其可得也"。　使求得之金櫝，如之。

東夷用石鏃，至魏晉時猶然。　魏志東夷傳云："挹婁……矢用楛，長尺八寸，青石爲鏃，古之肅愼之國也"。　據此魯語所載雖屬傳說，然其謂東夷用石鏃，則爲事實。　又禹貢載梁州貢砮磬，荊州貢砮丹，僞孔傳云"砮石中矢鏃"，是東夷及梁荊並有石鏃，而皆名砮。（今蒙語弓爲 nomo，音亦近弩，當爲古語之遺。）　又禹貢荊州貢箘簵楛；說文"箘簬竹也"；廣雅釋草"箘簬箘箭也"；古竹箭皆可爲矢，疑箘簬本爲矢名，因名竹箭可以爲矢者爲箘簬。　戰國策趙策一：

趙襄子召張孟談而告之曰："……無矢奈何？"張孟談曰："臣聞董子之治晉陽也，公宮之垣，皆以狄蒿苦楚廧之，其高至丈餘，君發而用之"。　於是發而用之，其堅則箘簬之勁，不能過也。

此卽謂箘簬爲矢，禹貢之楛，僞孔傳謂中矢幹，則箘簬當明指爲矢幹之用。　箘簬產於南方，故爲荊州之貢。　呂氏春秋本味篇云："越駱之箘"，注謂箘筍也，卽箘簬之筍，箘產越駱，越駱亦南方國。　說文箘，段注云：

箘簬二字一竹名，吳都賦之射筒也，劉逵曰："射筒竹細小，通長，長丈餘，無節，可以爲矢笴，名射筒，及由梧竹，皆出交趾九眞"。

段以箘簬爲射筒，射筒出交趾九眞卽今之安南，當更在越駱之南。　據此數事觀之，

弩砮簬古音同在魚部，弩砮並從奴聲，泥母字，簬從路聲，來母字，泥來母字長江流域之人多不別，故弩砮簬三字當同出一源。　史記武帝紀"路弓乘矢"，路弓即弩弓。疑名弓或幹或鏃之爲弩，爲砮，爲簬者，當爲古亞洲民族之通語。　其通行區域，北起肅愼，南迄荊梁交趾九眞及印度各地，故 dhanu 一名，决不能視爲印度所獨有。

弩古又通名爲弓，如：

一心以爲鴻鵠將至，思援弓繳而射之。——孟子告子上

善弋者下鳥乎百仞之上，弓良也。——呂氏春秋功名

蒲且子之弋也，弱弓纖繳，乘風而振之，連雙鶬於靑雲之際。——列子湯問

若王之於弋誠好而不厭，則出寶弓，婆新繳。——楚世家

楚馯臂字子弓——史記仲尼弟子列傳

此所謂弓皆指弩言，甲骨文及銅器又有弘字，象弛弓有臂形。當爲弩之本字，弘之偏旁厶，篆書多從又，作厷。　說文"厷臂上也"，厷爲臂上，當由象弩臂之弘引申得義。

前五·六　前五·一五　前五·一五　前五·一五　毛公鼎　秦公毁　頌壺　頌毁　毛公旅鼎　守毁　賁弘匜

王引之春秋名字解詁下云：

楚馯臂字子弓，弓讀爲肱，古字弓與弦通。　鄉射禮"侯道五十弓"，鄭注云："今文弓爲肱"，昭三十一年春秋"邾黑肱以濫來奔"，公羊作黑弓（又鄭公孫黑肱字白張，肱亦謂弓）。

據此弘之象弩形，似可無疑。　弘見於甲骨文及西周銅器，故據現有之史料言，中國之有弋射與弩，當遠在殷周以前，史載中國之南方民族，多用弩，其最早之記載如漢書地理志云：

粵地……自合浦徐聞南入海，得大州，東西南北方千里，武帝元封元年略以爲儋耳朱崖郡，民皆服布如單被，穿中央爲貫頭。　男子耕農種禾稻紵麻，女子桑蠶織績。　亡馬與虎，民有五畜，山多麈麖。　兵則矛，盾，刀，木弓弩，

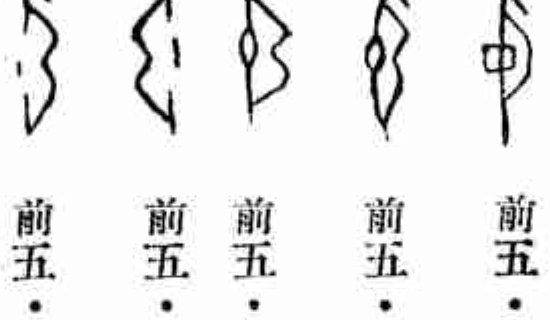
竹矢，或骨爲鏃。 自初爲郡縣，吏卒中國人，多侵陵之，故率數歲壹反。 元帝時，遂罷棄之。……自夫甘都盧國船行可二月餘，有黃支國，民俗略與珠崖相類。

漢之儋耳珠崖郡，卽今之海南島。 漢書所述其地習俗如服布如單被穿中央爲貫頭，絕非中國所有。 其地又無馬與虎，知尙未受中國文化影響。 又黃支國民俗略與珠崖相類，黃支國之所在，據藤田豐八前漢關於西南海上交通之記錄（見藝文第五年十及十一號，又東西交涉史南海篇）以爲卽新唐書南蠻傳之千支佛，並以今印度之 Conjeveram 擬其地。 其俗略與珠崖相類者，當指服飾用具言，後漢書南蠻傳云：

凡交趾所統，雖置郡縣，而言語各異，重譯乃通，人如禽獸，長幼無別，項髻徒跣，以布貫頭而著之。

此以布貫頭之習慣，大概卽爲自黃支以東以至儋耳珠崖等南方民族所同有者。 珠崖用弩，當卽南方民族素來所習用者。 故弩之在南方，亦當有極悠遠之歷史。 吾人如據此南方之史料論之，實不能斷定此最初使用弩之民族之爲漢族，抑爲印度，或其他南方民族。 雖然，弩之爲用，在中國不獨用之發矢，且可用以發彈。 吾人如就彈之使用言之，關於此問題當不難得一解決之途。 吳越春秋卷九謂"弩生於弓，弓生於彈；"此說雖屬臆測，然弓之有臂，實於彈爲尤便。 蓋彈之發射必斜引之，其丸射出時所行之道，適與臂之位置相同。 有臂以發彈，使初習射者，可不至有自彈之危險。 至於矢之發射，則無此種顧慮。 故弓之有臂，最初當爲彈而設。 而彈則中國所獨有。 史載中國歷代之南方民族，皆有弓弩而無彈，北族亦無彈見發彈射鳥，則以爲引空弓而落飛鳥，魏書始祖神元帝紀云：

始祖聞（文）帝歸，大悅，使諸部大人詣陰館迎之。酒酣，帝仰視飛鳥，請諸大人曰："我爲汝曹取之；"援彈飛丸，應彈而落。 時國俗無彈，衆咸大驚。…………始祖問曰："我子（文帝）既歷他國，進德何如"？皆對曰："太子才藝非常，引空弓而落飛鳥，是似得晉人異法怪術，亂國害民之兆，惟願察之！"



前五·八　前五·九　前五·八　前五·八　前五·八

此可見南北各民族均無彈。 印度亦無彈。 至中國之有彈，亦遠在殷商以前。 甲骨文有彈字，象彈之形。 說文彈或作弓，從弓持丸，與甲骨文彈字形同。 又殷虛有紅土所作彈丸甚多， 其大小形製與現今平市所售之彈丸無殊， 當卽商代彈弓用之彈。 又弋射所用之繳係絲製， 絲亦中國所產。 據此而言，最初用弩之民族，當卽居住黃河流域之中華民族。 南方民族及印度之用弩，疑當由中國輸入。

七 關於弋射之事物及弋射衰歇之故

弋射盛於魏晉以前 ，關於弋射之事物 ，其爲上文及拙著古代狩獵圖象考所未及者，玆再述之如次。

古代弋射除具矰繳弓弩礛碆之外，又有所謂廩者，如：

桓公弋在廩，管仲朝，公弛弓脫釬（疑當作鼾卽杅字）而迎之。——管子戒篇

田子方問唐易鞠曰："弋者何愼？"對曰："鳥以數百目視子，子以二目御之，子謹周子廩"。田子方曰："善！子加之弋，我加之國"。 鄭長者聞之曰："子方知欲爲廩，而未得所以爲廩，夫虛無無見者廩也"。 一曰齊宣王問弋於唐易子曰："弋者奚貴"？ 唐易子曰："在於謹廩"。 王曰："何謂謹廩"？ 對曰："鳥以數十目視人，人以二目視鳥，奈何其不謹廩也，故曰在於謹廩"。 "然則爲天下何異爲此廩？今人主以二目視一國，一國以萬目視人主，將何以自爲廩乎"？ 對曰："鄭長者有言曰，'夫虛靜無爲而無見者 ，其可以爲此廩乎'"！——韓非子外儲說右上

文選射雉賦徐爰注"廩翳中盛飲食處，今俗呼翳名曰倉也；"字又作籢，說文"籢雉射所蔽者也；"段注"此卽射雉之翳也亦謂之廩，廣雅廩作篠（案廣雅釋器云"籢籞篠翳也"）；是翳爲總名，而廩爲翳中盛飲食處，析言則異，統言則不別。 翳之製，據文選射雉賦"爾乃擊場挂翳停僮葱翠"徐爰注云：

擊者開除之名也，今傖人通有此語；射者聞有雉聲，便除地爲場，挂翳於草；停僮翳貌也，葱翠翳色也。

據此翳當以竹製，故其色葱翠而籢篠字並從竹。 新序雜事篇云："不知弋者選其弓弩，修其防翳，加矰繳其頸"； 新序此文乃取於戰國策楚策而略異其文，防翳楚策作

葬盧，古或以葬盧爲之（左傳昭二十年"鄭國多盜，取人於萑苻之澤；"葬苻同，說文從艸之字，籀文多從茻，苻盧萑苻葭葦之屬）。

說文又有䲨䳗字，說解並云："惟射收繳具；"段注云：

按兩字同義，蓋其物名䲨䳗，上字當云䲨䳗惟射收繳具，下字當云䲨䳗也。

䲨䳗字僅見於此，東漢當有其物。

戰國有佐弋之官，韓非子外儲說左上云：

衞人有佐弋者，鳥至，因先以其捲麾之，鳥驚而不射也。

漢武更名左弋爲佽飛，漢書百官公卿表云：

武帝太初元年更名……左弋爲佽飛…… 佽飛掌弋射，有九丞兩尉。

佽飛之義，據漢書宣紀注云：

服虔曰："周官度江，越人在船下負船，將覆之，佽飛入水殺之，漢因以材力名官。" 如淳曰："呂氏春秋荊有茲非，得寶劍於干將，度江中流，兩蛟繞舟，茲非拔寶劍刺兩蛟，殺之，荊王聞之，任以執圭，後世以爲勇力之官。 茲佽音相近"。 臣瓚曰："本秦左弋官也，武帝改曰佽飛，官有一令九丞，在上林苑中，結矰繳，弋鳧雁，歲萬頭，以供祀宗廟"。 許愼曰："佽便利也，便利矰繳，以弋鳧雁，故曰佽飛，詩曰'抉拾既佽'者也"。 師古曰："取古勇力人以名官，熊渠之類是也，亦因取其便利輕疾若飛，故號佽飛，弋鳧雁事自使佽飛爲之，非取飛鳥爲名，瓚說失之"。

此注服虔如淳師古並以爲人名，卽取古勇人以名官。 瓚說佽爲便利，飛爲飛鳥，謂便利矰繳以弋鳧雁，故曰佽飛。 余意弋以射飛爲主，佐弋名佽飛，則飛自當指飛鳥言。 古人有以事爲名者，如長沮桀溺荷蕢接輿之類皆是，荊之茲非其初或由佐弋得名，亦未可知。 師古謂瓚說失之，未允。

弋射之事至東晉以後乃漸趨衰歇，潘岳射雉賦序云：

余徙家于琅邪，其俗實善射，聊以講肄之餘暇，而習媒翳之事，遂樂而賦之也。

徐爰注云：

媒者，少養雉子，至長狎人，能招引野雉，因名曰媒。 翳者，所隱以射者

也。　晉邦過江，斯藝乃廢，歷代迄今，寡能厥事；嘗覽茲賦，昧而莫曉，聊記所聞，以備遺忘。

潘岳西晉時人(約西元三世紀末)，徐爰劉宋時人(約五世紀中)，相去僅百有餘年。而此弋射之事，在潘岳作賦時，稱其俗實善射，則其時之盛行可知。　及徐爰作注乃云"歷代迄今寡能厥事"，則其廢似又甚久。　此數千年來相傳之舊俗，何以在此百餘年間驟然衰歇？此其故乍觀似不易索解，然據上文推之，則亦不難擿發其覆。

余於上文曾斷定弋射原於黃河流域之中華民族，北族及南蠻均無此習慣。　此種狀況迄至魏晉時代，當仍無改變。　西晉之末，胡羯鮮卑迭主中原，騎射為胡俗所長，自不屑效華人為弋射；而華人捨其舊習，薰染胡風，亦為此時之風尚。　顏氏家訓教子篇云：

齊朝有一士大夫，嘗謂吾曰："我有一兒，年已十七，頗曉書疏，教其鮮卑語及彈琵琶，稍欲通解，欲以此伏事公卿，無不寵愛，亦要事也"。

此可見當時風尚之一斑。　至於隨晉室以南渡者，多屬中原士族，雅尚清談，於弋射原所不嫻，以故此中原之舊俗，終不能隨晉人而移植於江南。　弋射之風遂於此百餘年間，驟然銷歇。　今歐風東漸，新舊之消長又不啻什伯於此，比例以觀，則弋射銷歇於此時，適為當然之事。

八　弩之强弱及其他相關之事

弩之强弱，以鈞石計。　管子輕重甲有十鈞之弩，出土漢弩機所鐫有四石六石七石八石者 (參看容庚漢金文錄卷六)。　禮記月令鄭玄注云三十斤曰鈞，百二十斤曰石，是十鈞之弩僅得漢弩之二石半。　古弩力之懸殊如此者，當由於開弩時所用之方法而異。　弩以足開者曰蹶張，以手開者曰擘張。　蹶張力較强。　又有以腰開者，乃繫繩於腰，以增加蹶張之力。　明茅元儀武備志云：

弩之力腰開者可十石，蹶張者可二三石，古所云弓之强者，不及也。　晉馬隆平樹機能猶藉腰開弩，至宋而其法不傳。……近世程宗猷得古銅機，斟酌竹弩而為古弩，……然皆蹶張弩也。　宗猷又自以其意合古人之說而為腰開弩，强者可十石，下者亦可七石，此千載久廢之器，復啓於斯人。

此所謂蹶張，乃繫繩於弩臂之一端而以足踹而張之，與漢武梁祠畫象所鐫之蹶張不同。武梁所繪一人坐地，兩足分置臂之兩旁，前抵弓，兩手鉤弦，向後引之，與武備志所圖腰上弩弦之形較，惟不繫繩於腰，餘大致相同。疑武備志所謂蹶張，即古之擘張，而漢弩機自四石以至八石者，當即所謂蹶張。腰開之法其力僅略勝蹶張，不必即出漢代以後，晉書馬隆傳云：

> 隆限募腰引弩三十六鈞，弓四鈞，立標簡試，自旦至中得三千五百人。……於是西渡溫水。虜樹機能等以衆萬計，或乘險以過隆，或設伏以截隆，後隆……且戰且前，弓矢所及，應弦而倒。

此腰引即武備志之腰開。三十六鈞計得九石，四鈞計得一石。據此及上文，知古代弓弩强弱相差之數。此謂腰引弩九石，武備志謂腰開强者十石，下者七石，與漢代蹶張之七石八石者，直無若何差別。或漢代七石八石弩，已用腰開，亦未可知。又呂氏春秋壅塞篇載：

> 齊宣王好射，說人之謂已能用彊弓也，其嘗所用不過三石，以示左右，皆試引之，中關而止，皆曰："此不下九石，非王其孰能用是！"

此所謂三石之弓非弩不能當之。古弩亦通稱弓，說已見前。至九石乃與馬隆腰引弩之力同，尤非尋常彊弓所能及。疑戰國之末年，即作呂氏春秋時，或已有腰開弩，故當時傳說，得以此為譽。（古今度量雖不一，但亦不能相差過遠。）

出土弩機，大致均可視爲蹶張之弩上所用者。此種弩機，就其所鐫之文字觀之，其年代約自戰國之末迄於魏晉之際，千有餘年。疑此期即爲蹶張盛行之時。至唐代則盛行擘張。唐六典載弩製有七，而擘張居第一。通典弩部云：

> 弩古有黃連百竹八擔雙弓之號，今有絞車弩，中七百步，攻城壘用；擘張弩中三百步，步戰用之；馬弩中二百步，馬戰用之。

此所述諸弩，黃連即大黃參連弩之省稱，百竹即積竹以爲弩擔（參看武備志造弩擔用竹說，此所謂擔，即弓，）八擔或指用竹之數，雙弓當即武備志之合蟬弩（謂兩弓相合如蟬形，）絞車弩或即古連弩車之類。據此所述，當時步兵所用僅擘張，知其時之蹶張，業已式微。擘張中三百步，僅及蹶張之半（史記蘇秦傳謂韓有谿子少府時力距來皆射六百步之外），其力既弱，機之構造當不須如蹶張之複雜。故出土遺物

中無晉以後之弩機。 晉以後蹶張所以式微而擘張代興者，亦有故。 通典弩部又云：

> 弩之張遲不過一二發，所以戰陣，不便於弩。

蹶張力雖強而張遲，不便於戰陳，故力弱之擘張，得以代之。 宋代盛行之神臂弓，亦擘張之遺製。

漢以來弩有名大黃者，其力最強。 六韜軍用云：“陷堅陳，敗強敵，用大黃參連弩，史記李廣傳云：“廣身自以大黃射其裨將；”集解引鄭德曰：“黃肩弩淵中黃朱之”，又引韋昭曰：“角弩色黃而體大也”，索隱案云：“大黃間弩名，韋昭說是也”，此謂大黃卽黃間，間又作肩，黃謂弩淵中之色（淵卽弣之兩旁曲處，）張衡西京賦云“黃間機張”，潘岳射雉賦云：“奉黃間以密彀”，皆謂此。 黃間之外，又有紫間赤黑間之名。 陸機七導云：“操紫間之神機，”積古齋鐘鼎彝器欵識卷十有中郎將曹悅赤黑間弩機，似皆就其色之不同而異其名者。 武備志諸弩圖說云：

> 古人自踏張者，其飾有黑漆，黃白樺，雌黃樺，稍小則有跳鐙弩，木弩，跳鐙弩，亦曰小黃，其用尤利。

此諸弩名稱，皆就其飾言（樺木名可以飾弓，漢書司馬相如上林賦“華楓枰櫨”注，師古曰：“華卽今之皮貼弓者也”）小黃或卽大黃而小者。

張弩古稱曰彀，其字本當作鉤，亦作句，音轉爲彀。 釋名云：“鉤弦者曰牙，儀禮大射儀云：“右巨指鉤弦，”詩大雅行葦“敦弓既句，”張衡東京賦易之曰“彫弓既彀”， 王引之春秋名字解詁上云：

> 楚王子鉤字發，成十六年左傳囚楚公子茷，正義曰：“晉語謂之王子發鉤，蓋一名一字也”。……鉤讀爲彀，爾雅釋詁釋文“彀古豆反，一音古侯反”， 古侯反則音鉤矣。 顏師古注漢書馮唐傳曰：“彀音溝”，溝與鉤同音。

此稱張弩曰鉤，曰彀，意指鉤弦，仍與張弓無異。 戰國以來，弩力漸強，彀不足以盡張弩之義，乃易彀而爲彍，字又作彉，作鞹。 方言一：“張小使大謂之廓，”錢繹箋疏云：

> 說文“彍弩滿也，讀若郭，”廣雅“彍張也，”曹憲音廓，淮南兵略訓云：“疾若彍弩”， 孫子兵勢篇云：“勢如彉弩”，漢書吾邱壽王傳“十賊彉弩，百吏不敢

前"，張晏音郭，顏師古注"引滿曰彍"，太平御覽引尸子云："扜弓鞹弩"，彍鞹並與彍同。公孫丑篇"知皆擴而充之矣"，趙歧注"擴廓也"，孫奭音義引丁公著云："擴張大也"，義並與廓同。

此釋彍最爲詳盡，此雖一字之改易，而弩力之加强，亦可因此而窺見其消息。

九 餘論

弋射與弩，在中國文化上雖佔一重要地位，但歷來學者從未注意及此，因由此而起之若干名物，在舊注中均失其正解。余於此乃冥行擿索，積思如痗，所得雖至僅，然據此以推論殷商以前東方文化之來源，亦不無一隙之明。

安特生先生於其中華遠古之文化及甘肅考古記兩文中，以戈鬲（或鼎）及粟鑿爲起於東方之物。最古之弋射與弩，雖無遺物留存於今，然據甲骨文之象形字言之，殷代確已有矰繳與弩之存在。是殷商或其以前，東方所特有者，戈鬲粟鑿之外，又當有矰繳與弩。戈鬲與粟鑿，分布之地，今所知者，僅限於遼甯之貔子窩沙鍋屯及黃河流域兩岸之地。至黃河流域以南，則概無所聞。近代學者由人種方面，及言語方面，謂中華民族與西藏緬甸暹羅諸族關係至近，獨於古物方面，則猶缺然無徵。

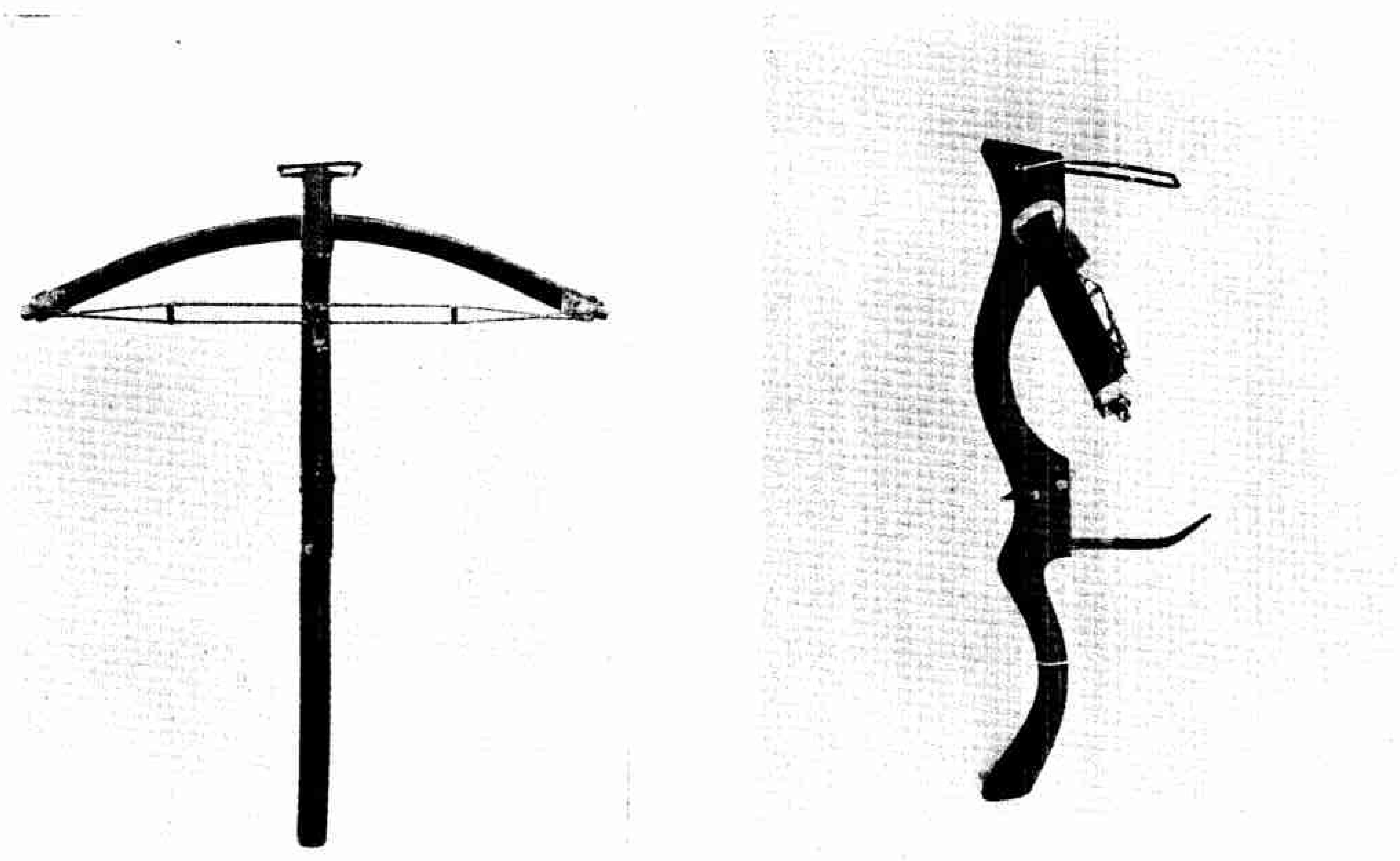
南方民族及印度之用弩，在元前或元前四世紀以前，雖無可徵，然觀其傳播之廣，則史前之中國，與南方民族及印度諸地，其關係或較有史以後尤爲密切。漢以前，中國政治上力量，雖未達於長江流域以南，然不能謂與此方卽無交通可言。

上文據彈及弋射之繳斷定最初用弩者，當爲居住黃河流域之中華民族，此說之當否，姑不必論，但觀使用弩之區域，偏於亞洲之東南，而漠北則絕無此種影響，此種分布狀況，必非有史以後之事。蓋有史以後，中華民族與漠北之關係，遠在南方民族之上；故弩在南方之傳播，必在有史以前。從而殷商以前之文化，必受有若干南方文化之影響，其消息不難於此中求之。

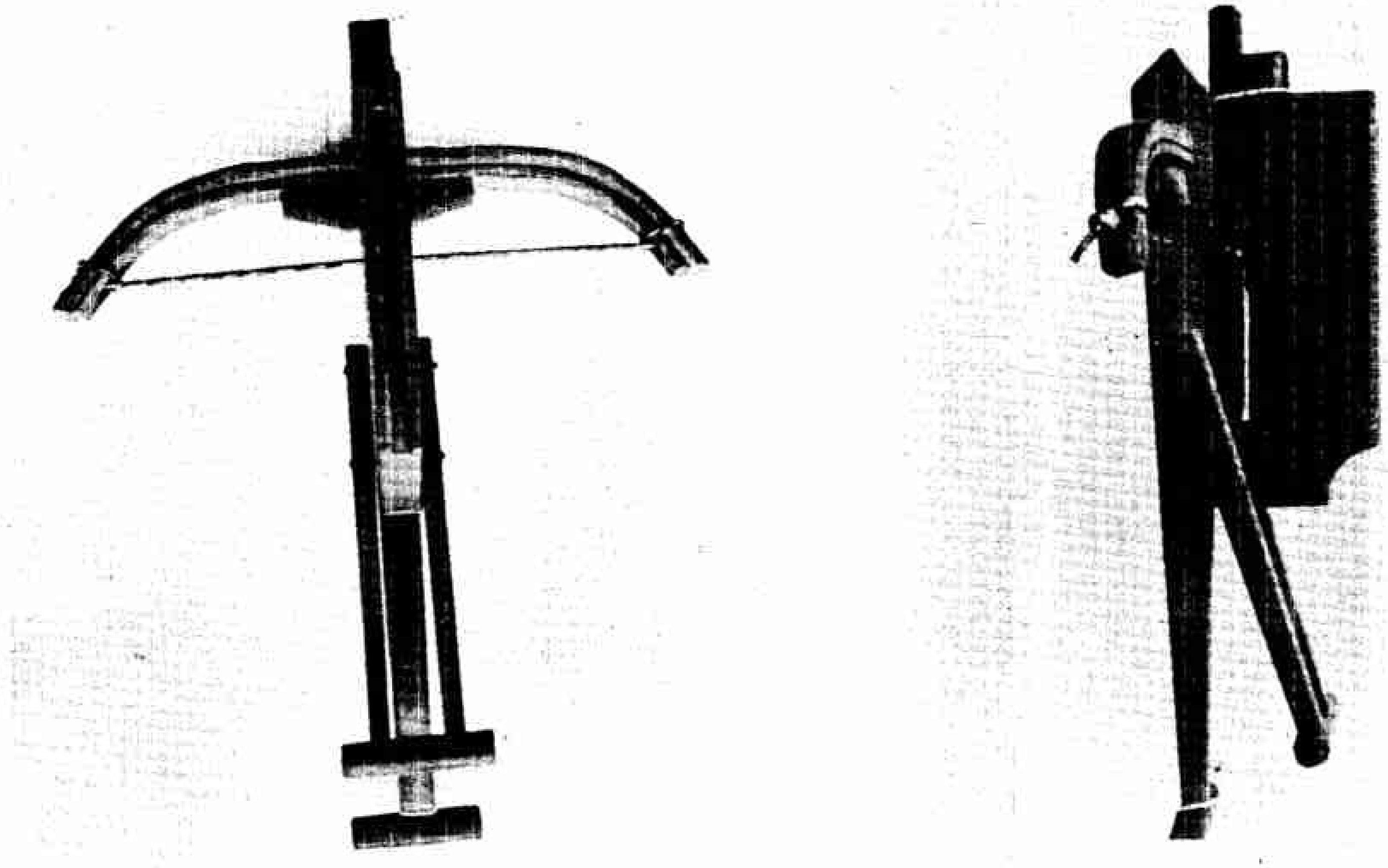
此文所據者旣爲古代之象形字及繪畫，固與實物無殊。又今平市現存之弩，與數千年前者相較，其構造容有若干變遷，然就載籍中關於此類之名物言之，大致仍無若何差異。吾先民日常習用之物，如舟車屋宇兵器農具之類，其形製仍保存迄今者，所在多有，其有裨於考古如此類者，必不少。近來外貨益深入內地，此類遺物

日就湮滅，若不及時搜集，數十年後將無從徵考。 聞嘗與友人裴子元梁思永兩先生談，欲設一博物館搜集現代地面一切用具之實物或模型。 荏苒數載，此願猶虛。為此文竟，因並及之。 總之，此文固以徵實為主。 其論式與樞機參連，或足以正昔人之誤，發千載之覆。 其論弗弔叔夷弟己申弋弘必臾諸字之形體，亦與實物無間，當不至於大誤。 至於臆測之談，如于之象弩，柲之為檠榜，弩碆繳路之名稱，鈎彀彍韝之意義，弩之原起與弋射衰歇之故，及古蹶張之用腰引，雖不易於徵實，然亦不失為有理解之假設。 余為此文，用力至勤，故為道其甘苦如此；惟博雅君子，有以教之。

廿三，二，十九寫完，在北平北海靜心齋。



圖版一　北平市上所售之弩弓（長19寸，左正面右側面。）



圖版二　北平市上所售之彈弩（長$17\frac{1}{2}$寸，左正面右側面。）

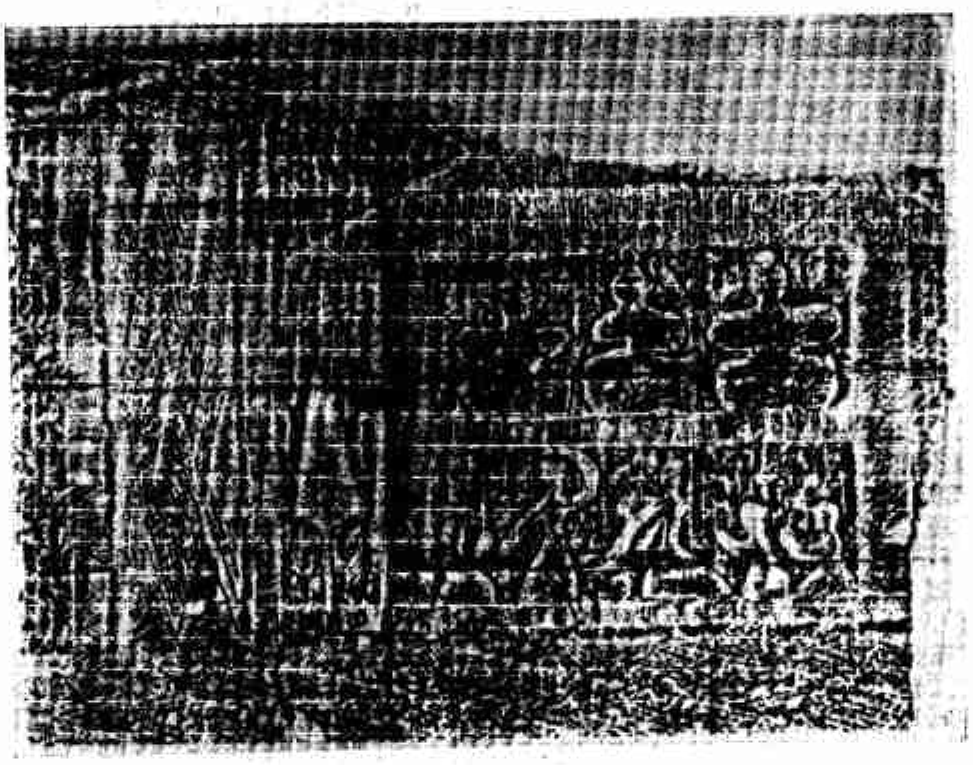
士王皇三字之探原

徐 中 舒

士王皇三字均象人端拱而坐之形，其不同者：王字所象之人，較之士字，其首特巨，而皇字則更於首上著冠形。　此三字舊說均失其解，玆舉四證以明之。

第一證　漢畫象中象士字之人及象皇字之冠

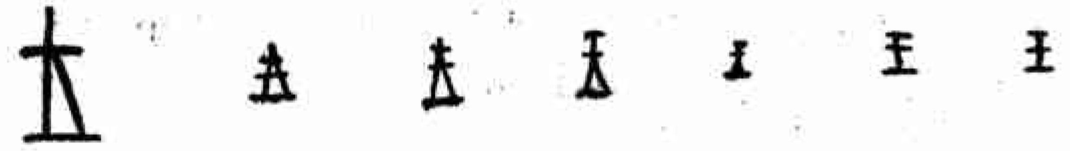
山東濟甯文廟戟門郭泰碑陰畫象之右半刻一室，室中上層，三人端拱而坐，形與士字無殊，(插圖一)此即士之原始象形字。



插圖一

士象人形，故古代以爲男子之通稱。　如詩易多稱士女，士女猶今之男女。　又詩稱庶士，易稱士夫，庶士士夫，亦指男子言。

甲骨文王字有下列諸體(據孫海波甲骨文編選錄)：

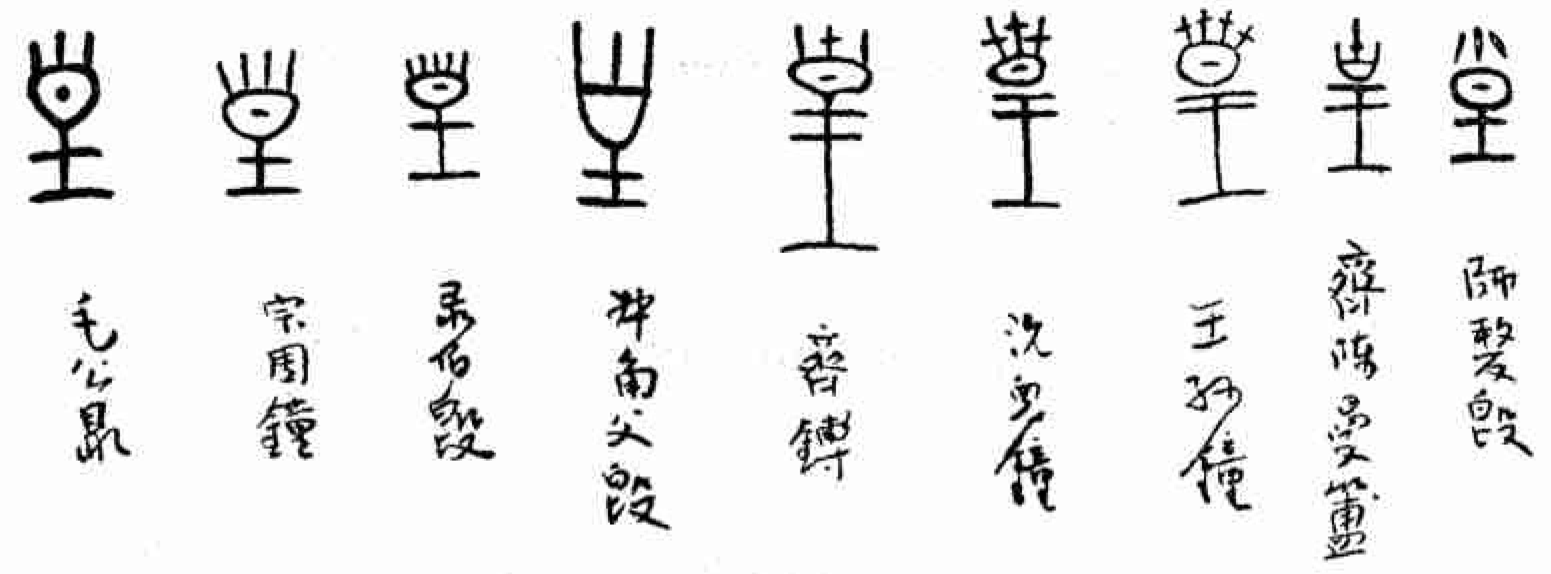


據董彥堂先生研究，謂太乃甲骨中最早期之書體，太太次之，最晚乃與小篆或今隸同。　甲骨中之太字，實與士字形同。　甲骨文由刀筆刻畫而成，不便作肥筆，故太兩橫畫中間，乃以八筆爲之。　如作肥筆，則當如上列第五字例作土，其形即與士字無別。　古士字上下兩横，原無長短之別，小篆及今隸士字下一畫略短者，蓋以別於土字；然此種分別，在甲骨文及銅器中則不需，因甲骨文土作♀，銅器作土，皆與士截然有別。　臣辰盉士作土，下畫且較長，其形尤與甲骨文之太字相似。　古代士庶對稱，士爲官長，庶爲編氓；又治獄之官稱士，左氏僖二十年傳“士榮爲大士”，杜注“士治獄官也”；又獄官之長亦稱士，漢書百官公卿表上‘咎繇作士”，注引

應劭曰：“士獄官之長”：蓋王為帝王，士為官長，故並象其端拱而坐之形。

晚期甲骨文王作丟或王者，上一橫乃象其首形。　蓋王與士既並象人端拱而坐之形，而後人乃特將王字之首增巨以為分別。　此猶如大之與天，同象人形，而天字所象之首形亦特巨。　此種分別，在初造文字時或不甚顯著。　如古文中天大二字多互用，如周書之天邑商，甲骨文或作大邑，或作天邑，是。　因此吾人亦可推想古代階級觀念，當不如後代之甚，故王與士得同象人端拱而坐之形。

皇象王著冠冕形，甲骨文無皇字，但在銅器中則極常見，茲據金文編選錄如次：



小篆皇從自，此全不見有從自之形，據此可正小篆之誤。　汪榮寶先生有釋皇一文，載於北京大學國學季刊第一卷第二期中。　其說據禮記王制及內則“有虞氏皇而祭”之文，以為皇之訓冕，（本於鄭注）正其本義，小篆弁作覍，（說文弁冕也）上形作㕣，與古文皇上形極相似，（按尢與師嫠毁形同）明其同出一源。　汪氏此說，大致可信。

漢畫中多繪有周公輔成王圖，茲選載其較明晰者一幀（插圖二，武梁祠左石室畫象）其中成王之冠作山形，正象銅器皇字向上三出之形。汪氏以外國

插圖二

Couronne 之狀，比擬皇之形制，似猶不及此處能近取譬之更為可信也。　蓋舊籍所載禮制，天子之冠，就形式言，未必卽與臣庶有如何差別。　如冕為大夫以上之冠(見

說文）皮弁爲諸侯視朝之常服（見詩鳲鳩正義）即爲王制內則所載冕屬之皇，亦僅爲士之祭服。余意皇與弁，在形制上似無若何差別。說文謂弁從皃（貌）以皇所象之形擬之，其說亦不可信。皃之上半𡿺，與皇同，下象人形，與士同意。皇與弁之不同者，以王者著之，則爲皇，常人著之，則爲弁矣。

第二證　銅器之花紋及銘文

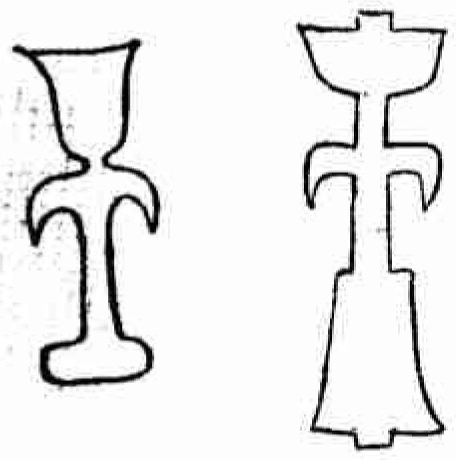
銅器之鼎簋近口緣處，或近底之圈足上，常環以寬半寸許之帶狀花紋。其花紋中有一種常見之樣式，即中鐫一人端拱而坐，旁著兩獸相立之形。此種樣式，可以武英殿彝器圖錄之歔簋圈足上花紋爲例（插圖三）因在其他銅器中，由於冶鑄時銅范接準之關係，此人形多中分而爲二，略成非字形，其兩旁之獸亦多變爲圖案形，不如此所圖人與獸，皆易於辨認也。

插圖三

插圖四

此花紋中之人形，即王之原始象形字。此有一極好之旁證：匋齋吉金錄卷一祖甲方鼎之銘文，有王字旁著兩獸形，正與此種花紋相同（插圖四）。比擬而觀，王之象人端拱而坐之形，可以無疑。

銅器銘文及小篆書王字作王，上兩橫畫相距近，下一橫畫相距遠。此其故，亦可以其所象之形釋之。王字上一橫畫象頭，中一橫畫象臂，下一橫畫象席地時裳之下幅之形。頭與臂相距近，故上兩橫畫亦相距近。臂與裳之下幅相距遠，故下一橫畫亦相距遠。銅器花紋中有繪人形者，於頭臂與裳之下幅之距離，不啻即爲王字作一極適當之說明（插圖五）。



插圖五

a. 遽册尊　b. 敂士卿尊
（均見善齋禮器錄卷三）

第三證　舊石器時代洞壁之繪畫

法蘭西南部及西班牙北部之山洞中，有舊石器時代人類所遺留之壁畫。　其所作人形，有與士或王文字形極相似者（插圖六——八）。　此種壁畫，爲歐洲舊石器時代晚期之物；可見此種作風在人類文明中，實有極悠遠之歷史也。

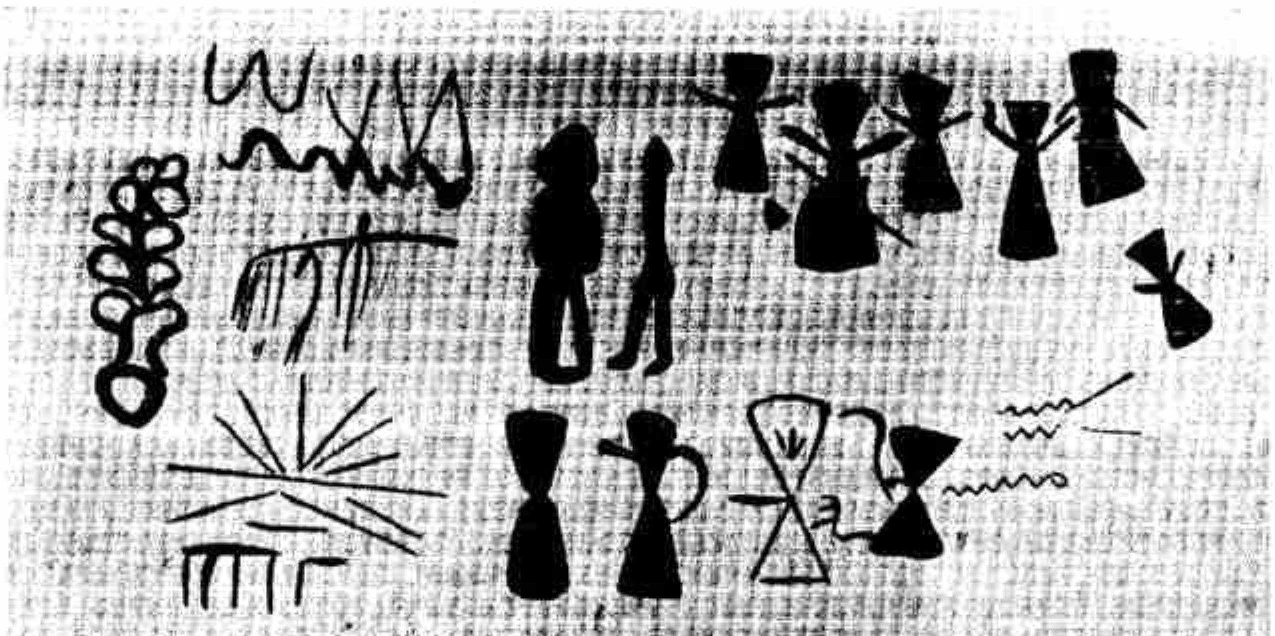


Fig. 27. — Las Moriscas (Helechal). Deux groupes importants de figures féminines alméiennes, un couple, personnages assis etc. Échelle 1/2. Le signe radié et les pectiformes c sont de la 1re roche de La Grajera (Sierra de don Tellejo).

插　圖　六

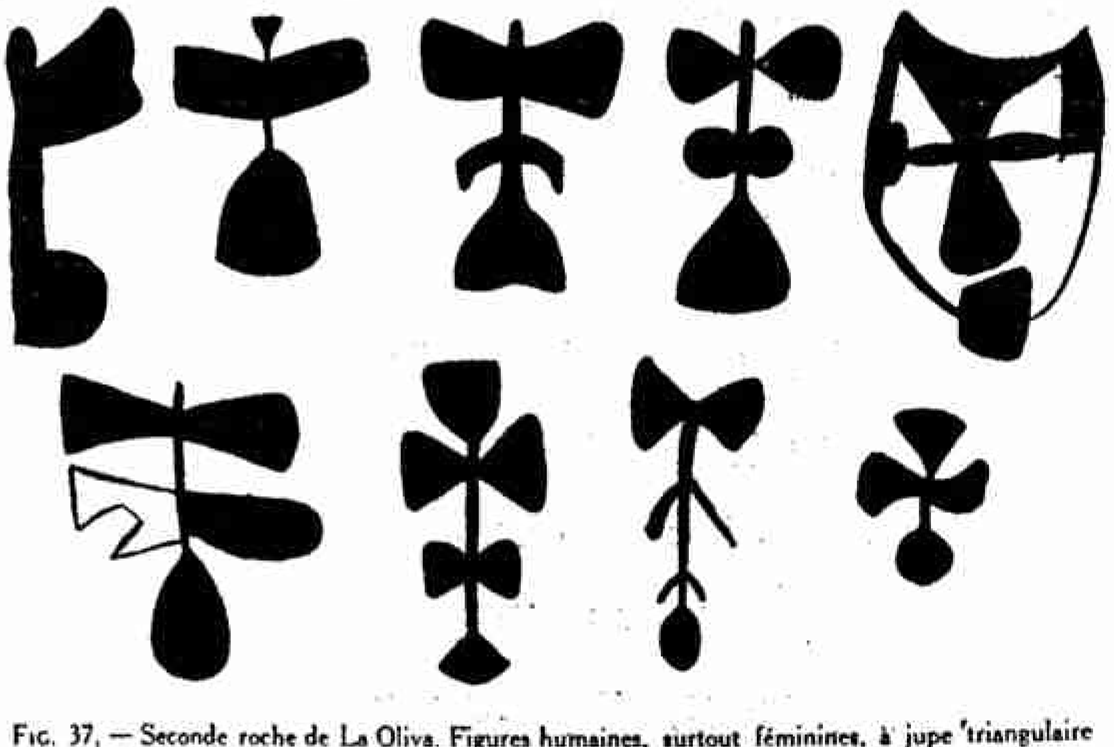


Fig. 37, — Seconde roche de La Oliva. Figures humaines, surtout féminines, à jupe triangulaire ou base ronde, l'une inscrite dans un scutiforme. Échelle 1/2.

插　圖　七

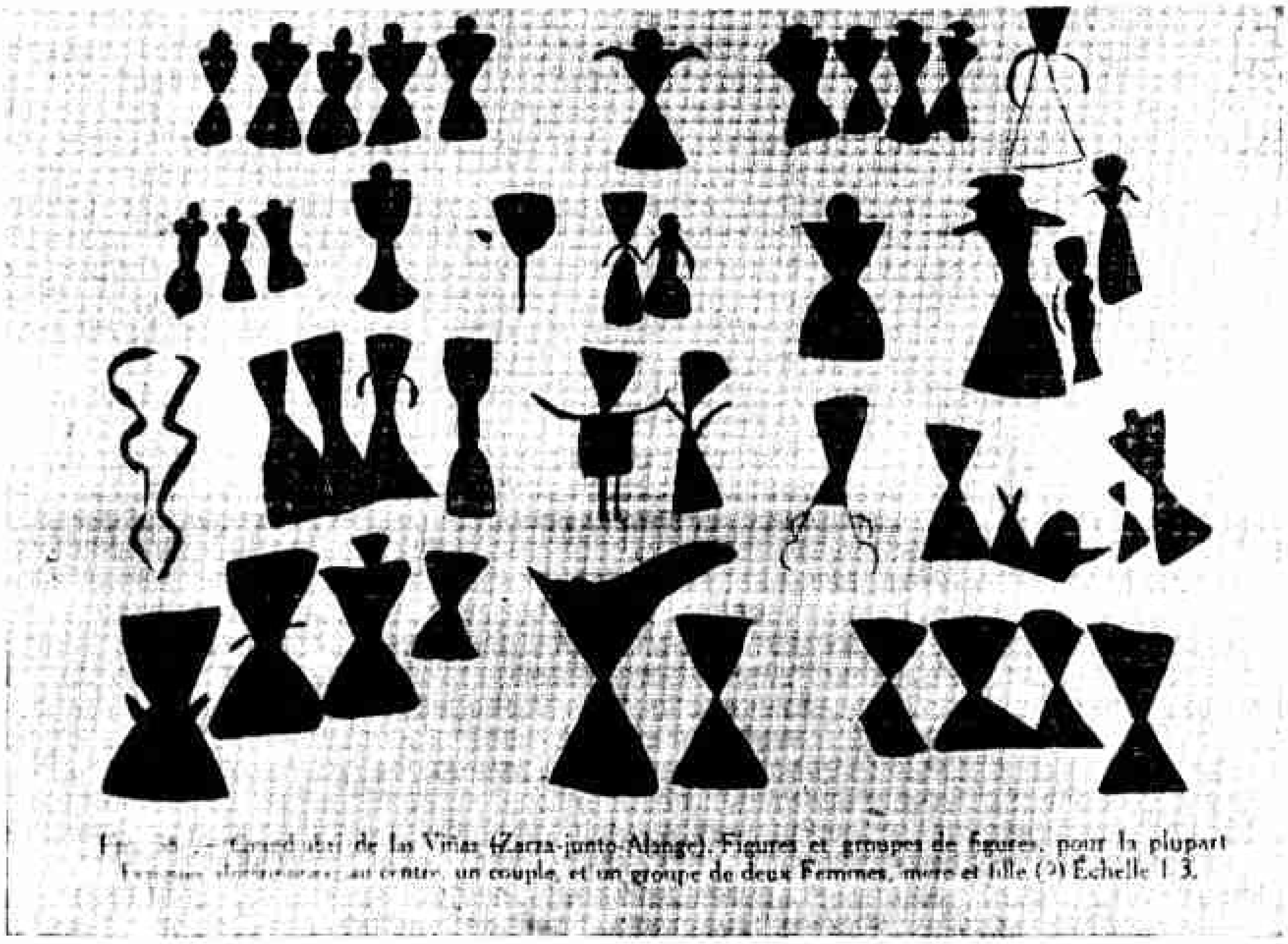
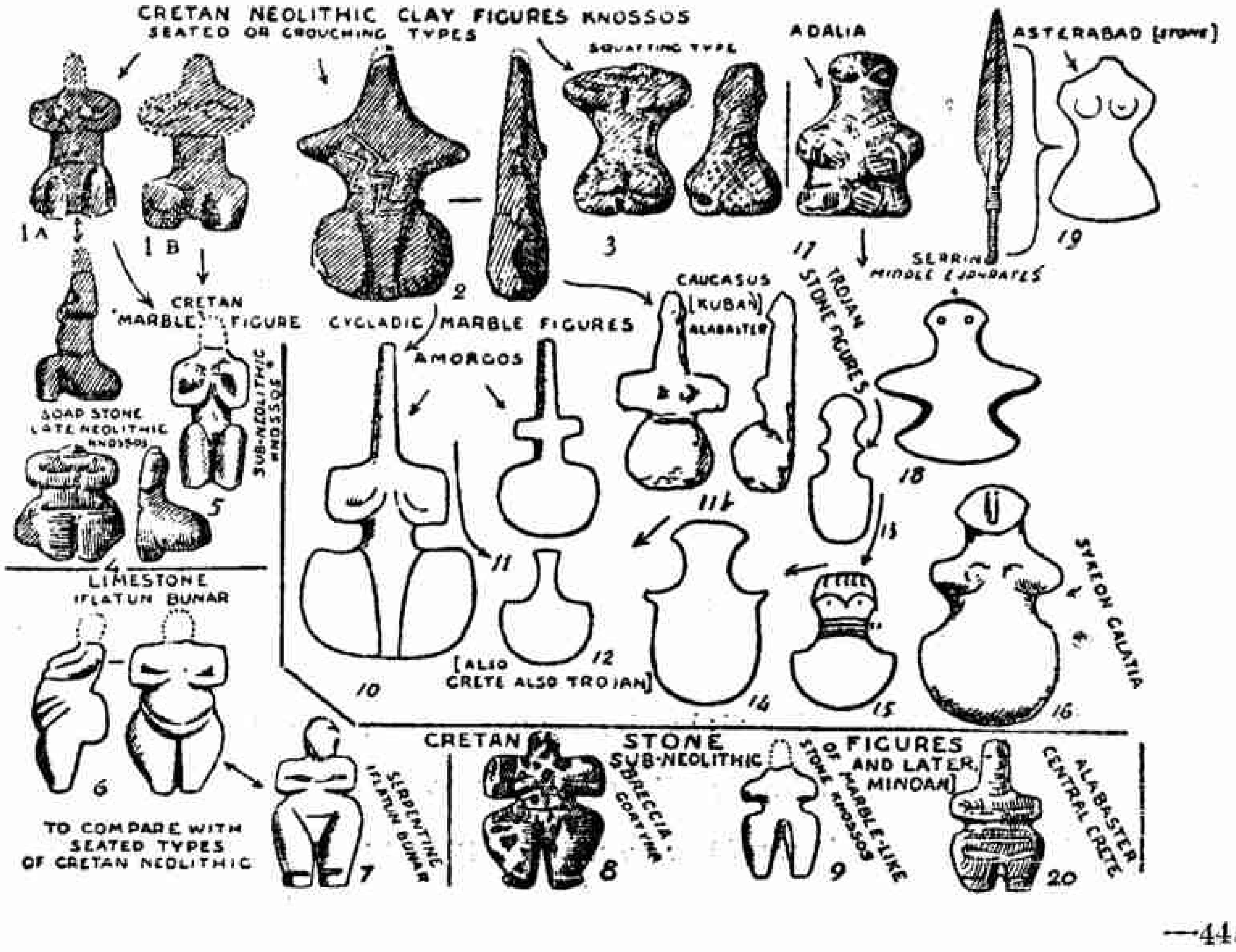


Fig. 38. — Grand abri de las Viñas (Zarza-junto-Alange). Figures et groupes de figures, pour la plupart Femmes [illegible]; au centre, un couple, et un groupe de deux Femmes, mère et fille (?) Échelle 1:3.

插圖八

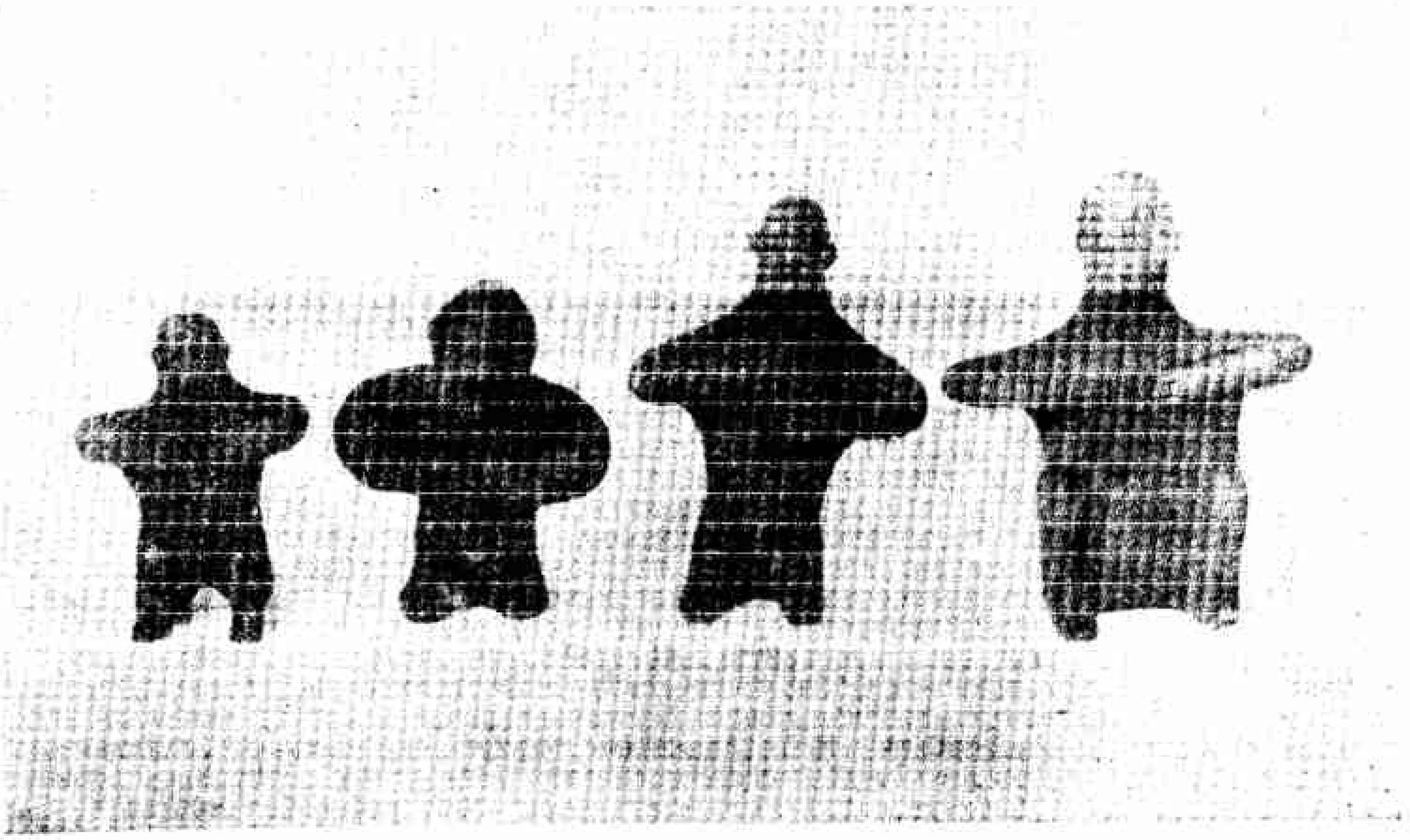
第四證　原始民族所作之偶像

象士或王字之人形作風，不但可徵之於中舊石器時代之壁畫，亦可徵之於原始民族所作之偶象。　歐洲石器時代所遺留之偶像，直與士或王字之形無殊(插圖九)。　此種



插圖九

作風，不但石器時代如此，即近代臺灣番族所作之泥俑，亦與此相逼似（插圖十，見林惠祥先生臺灣番族之原始文化，第六四圖）。



插圖十

結　　語

就以上四證觀之，人類文化，其初豈出於一源乎？抑各自創造，不期然而相暗合乎？何其無間東西，無間今古，而相似之若此其甚也！

二三，三，三，重寫於北平北海靜心齋。

插圖六,七,八見 L' Abbé Hewi Brevil: Les Peintures Rupestres schématiques de la Peninsule Iberiqne, II Bassin du guadiana 插圖 27. 37. 38.

插圖九見 V. G. Childe: The Dawn of European Civilization 插圖 10.

關中聲調實驗錄

白滌洲

目　　錄

(一)緣起

(二)關中之域區

(三)關中聲調之實驗

甲. 收音經過

乙. 推斷實例

丙. 實驗結果

(四)結論

(一)

民國二十二年春，我受了中央研究院歷史語言研究所之聘，到陝西去調查方音。一共去了六個月的工夫，關中區各縣大致都調查過了。　事畢歸來，首先整理的是關中的聲調。　因為這一部分用儀器，測斷計算，最費時間。　又因為我想研究關中入聲的變化，也非先知道聲調情形不可。　計自去年十月自滬歸來，到今年三月，整整半年的工夫，纔把關中聲調的實況，整理清楚；入聲的變化，訂定規律。　關於入聲變化問題，已另寫一文刊載中央研究院歷史語言研究所集刊外篇。　現在將關中聲調實驗的結果，發表於此。

本文發表，作者應向下列諸先生致謝：

中央研究院歷史語言研究所傅孟眞李濟之趙元任諸先生，因為我這次調查，本是受了中央研究院之聘，而這一次所發表的材料，將來也還要加入總報告關中音系一書中的。

吾師劉半農先生，因為我現在所有的一點點關於聲調實驗的知識，都是劉先生教給我的，而本文之成，也賴劉先生指導之力。

（二）

所謂關中，係指陝西省行政區域的關中區而言，也就是從前分道時的關中道。關中區位於陝西中部，東起潼關，西迄寶鷄，南聯漢中，北接榆林，共轄四十四縣。我這次調查，除柞水平民兩縣，因路途不便，人口寥落[1]，未曾調查；寶鷄汧陽兩縣，因路途不靖，未攜儀器，不曾收音；武功一縣，因發音人過於矜持，所收浪紋失敗外：共收得三十九縣的聲調。 現在先將這三十九縣的名稱，及在本文中的簡稱排列，並附一關中區域圖，如下：

長安(西)	朝邑(朝)	鄠縣(鄠)	栒邑(栒)
藍田(藍)	大荔(大)	盩厔(盩)	邠縣(邠)
雒南(雒)	郃陽(郃)	咸陽(咸)	長武(長)
商縣(商)	韓城(韓)	興平(興)	麟游(麟)
潼關(潼)	蒲城(蒲)	醴泉(醴)	隴縣(隴)
華陰(陰)	白水(白)	永壽(永)	鳳翔(鳳)
華縣(華)	澄城(澄)	乾縣(乾)	岐山(岐)
渭南(渭)	高陵(高)	同官(同)	扶風(扶)
臨潼(臨)	富平(富)	耀縣(耀)	郿縣(郿)
三原(三)	涇陽(涇)	淳化(淳)	

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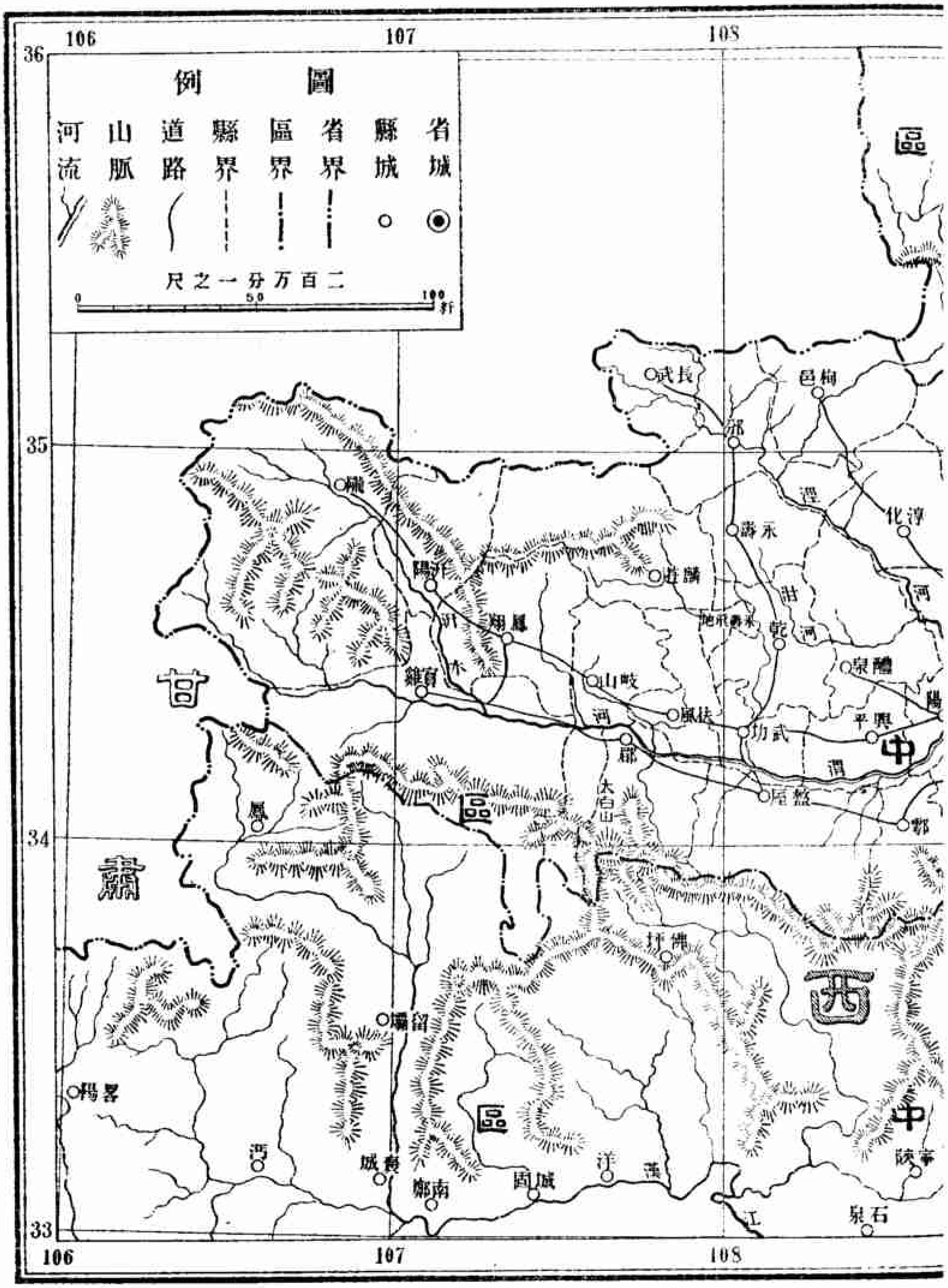
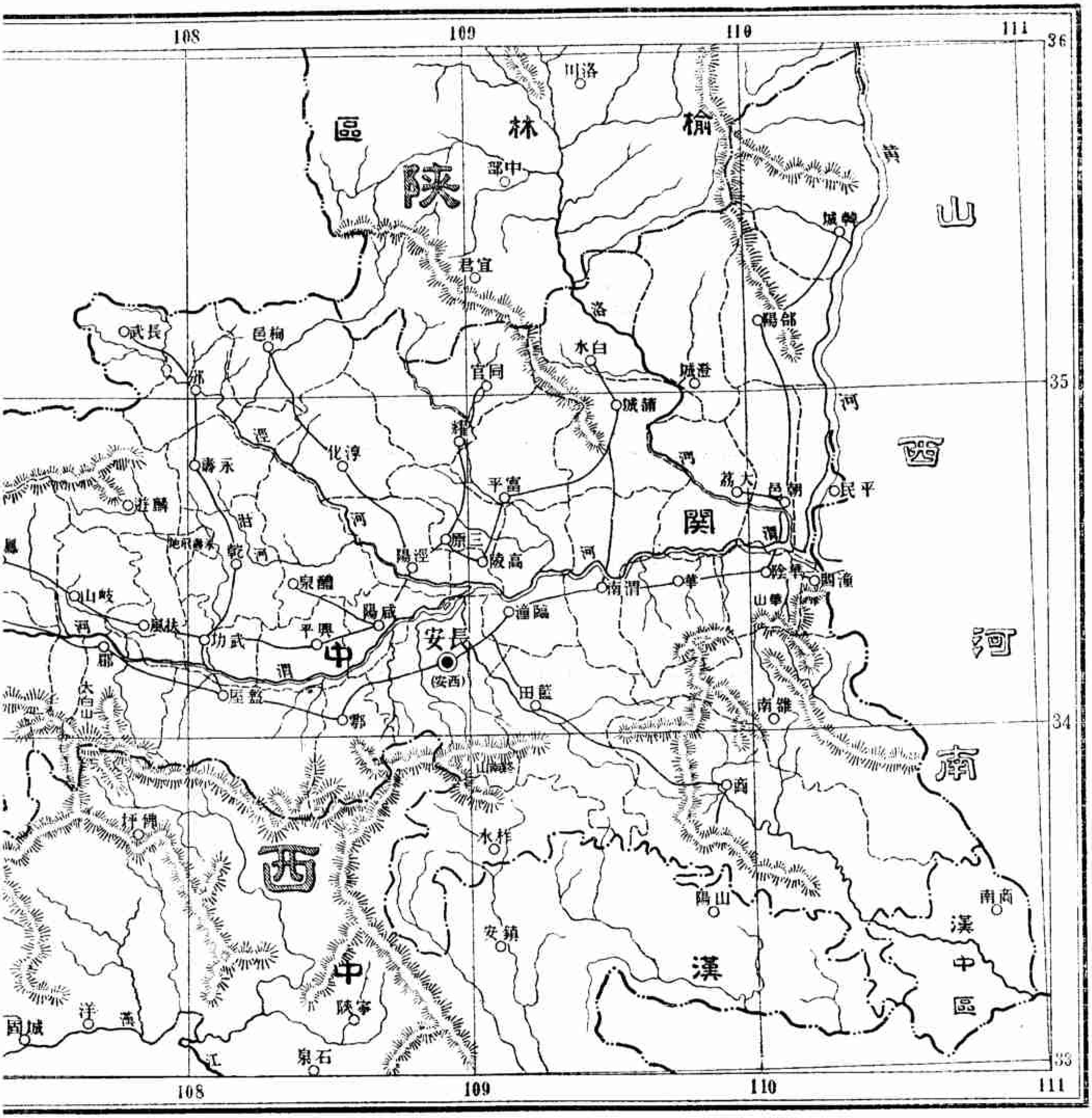
(1) 平民縣志輿地志云：“邑之封域，截長補短，不爲小矣，乃河流氾濫其中，以致人口離散，戶口寥寥”，又西京日報七月二十日載中央社通訊云：“柞水縣……街市蕭條，商業全無……人民頗少”。

區域圖


圖例
省城
縣城
省界
區界
縣界
道路
山脈
河流
二百万分之一尺
0
50
100粁
106
107
108
36
35
34
33
長武
栒邑
邠
淳化
永壽
麟遊
涇
河
隴
汧陽
鳳翔
永壽飛地
乾
醴泉
寶雞
岐山
扶風
武功
興平
郿
渭
盩厔
鄠
太白山
甘
肅
鳳
區
中
西
佛坪
留壩
略陽
沔
褒城
南鄭
城固
洋
漢
江
寧陝
石泉

關中區域圖



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區
山
西
河
南
漢
中
區
洛川
中部
宜君
韓城
郃陽
澄城
白水
蒲城
同官
耀
淳化
長武
栒邑
邠
永壽
麟遊
乾
醴泉
三原
涇陽
高陵
富平
大荔
朝邑
平民
華陰
潼關
華
渭南
臨潼
咸陽
興平
武功
扶風
岐山
郿
盩厔
鄠
長安
(西安)
藍田
雒南
華山
商
山陽
商南
鎮安
柞水
寧陝
佛坪
城固
石泉
太白山
終南山
涇
河
洛
渭
黃
河
江

(三)

甲．收音經過

我在陝西調查方音，每逢找到一個發音人後，第一步是請他讀許多字，找出他的方音系統。 第二步便是調查聲調。 調查聲調的手續分兩種：先用耳聽；再用儀器收。 耳聽時是把我豫備好了的平上去入各若干字，請他一一呼讀，我自己一面用刻有音程度數的漸變音高管(Sliding pitch pipe)模仿。 這樣我可以把他的調類弄清，同時把每個調值推測出一個大概。 調類弄清了，調值聽得出大概了，然後依他所有的調類找出幾個字來請他在儀器上讀。 儀器用的是浪紋計（Kymograph）。(1) 收音時很麻煩。 這麻煩不出在儀器的本身，而是出在不慣於向浪紋計說話的發音人。 有的人過於矜持，說不了幾個字便鬧得滿頭大汗；有的人過於小心，說了半天，不能使音鼓振動；有的人過於胆怯，無端把很容易認識的字讀錯。 所以收音時很費事，往往爲一個地方的聲調須找好幾個人。 但也有人說的很好，一上口便使音鼓的振動很合適，收下的浪紋很清楚。 遇見這樣的人我便不僅收下幾個單字的聲調，一定還請他讀許多詞，講幾句話，以至於唱幾首歌謠，念一段文章。 但如遇見收音困難的，就只好勉强收下幾個聲調單字，便算了事。 甚至於完全失敗，也是有的。

在陝西省帶儀器旅行是一件很困難的事。 第一是交通不便。 全關中區只有四條汽車路，由省城分達潼關大荔鳳翔長武。 然而車輛破舊，道路不平，人貨壅塞，行止不時，使你無法保護儀器；至於不通汽車的地方，僅恃馱運或大車，那困難更可想而知了。 第二是路途不靖。 全關中區只有由潼關到省城的一路較爲平靖，此外各地都有土匪。 西路汽車被刼，乃是常事。 而西北經長武通甘肅一路更是時常不通。 通汽車的地方尚且如此，不通汽車的地方更不難想像了。 倘你和一個住在長安胆子不大的人打聽路途情形，他一定告訴你連咸陽都去不得。 事實上雖沒有那麼嚴重，可是攜帶笨重行李總是"謾藏誨盜"的事。 所以我把儀器勉强保護到長安後便未他運；到旁處調查聲調時只靠着我的耳朵和一個漸變音高管。 幸而我在長安時趕

(1) 關於浪紋計的式樣用法種種說明，請參閱劉半農先生著四聲實驗錄第22節至28節。

上幾個訓練班，都是由省政府各廳處叫各縣派三兩個人來，作一種短期的技術的訓練，如防疫，鑿井，財政，以及農村合作講習之類。我便利用這機會，請求主辦人員，允許我於課外一一調查。聲調浪紋能收到三十九縣之多，都是這種機會賜給我的。

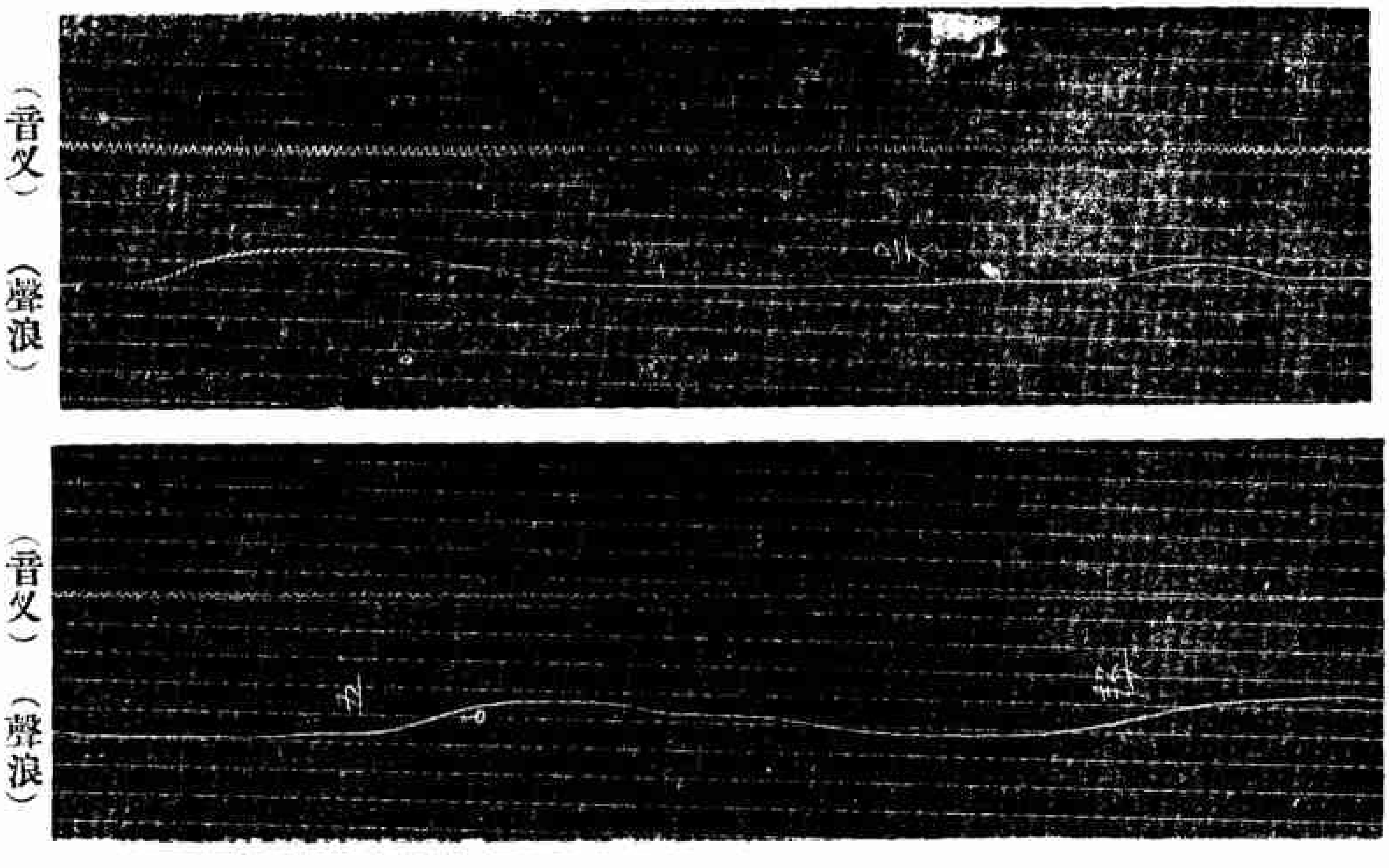
乙. 推斷實例

依所收聲調浪紋來推斷聲調的高低起落，我用的儀器是劉半農先生最近創製的"乙二聲調推斷尺"。關於乙二聲調推斷尺的用法，請參閱劉先生的說明[1]，本文恕不多贅。本節目的，只想舉一縣作例，說明推斷工作的歷程及其結果，一方面使讀者明瞭推斷工作的情形，一方面"舉其一以概其餘"，此外各縣聲調情形便只報告結果，不再逐一敘述。

現在舉推斷長安的聲調爲例。

所收的浪紋是這樣：

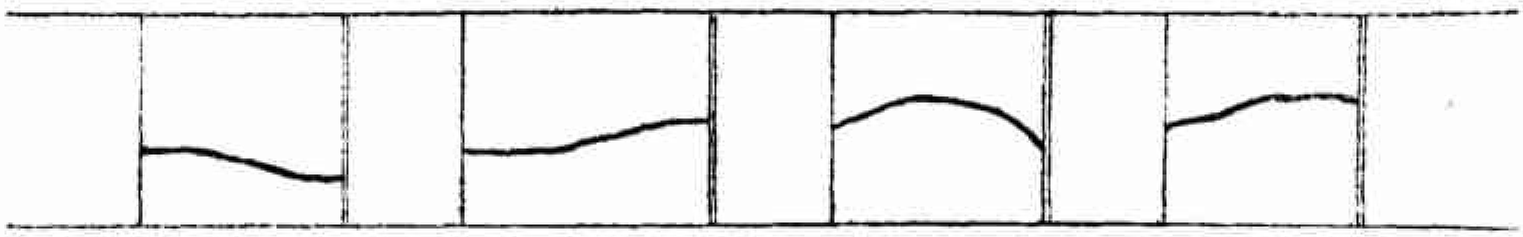
第一圖



(1) 參閱本刊233頁至239頁劉先生乙二聲調推斷尺一文

推斷時，先將這煙薰紙舖好，一面將乙二聲調推斷尺展開，依法求出四個聲調的起落線，如第二圖。　然後再求煙薰紙每秒鐘的速率。　求速率的方法是要數與長安

第　二　圖



聲調浪紋同時收得的標準音叉的浪紋　。　譬如我當時所用的標準音叉是每秒鐘振動128次，便在煙薰紙上細數標準音叉的浪紋。 數到一百二十八個浪紋處，作一記號，這一段浪紋總長便是煙薰紙在浪紋計圓柱體上每秒鐘轉動的長度，也就是煙薰紙每秒鐘的速率。　用尺量一量，長112 *mm.*,卽煙薰紙的速率，每秒鐘是112 *mm.*。 若還怕浪紋計上的圓柱體轉動的速率不甚均勻，不妨就音叉浪紋，掉換地方，多數幾次。譬如第一次數的結果，長度是 112 *mm.*，第二次的結果是115 *mm.* ，第三次的結果是 111 *mm.* ，第四次的結果是 110 *mm.*, 於是將四數相加 ，以四除之，得出平均數 112 *mm.*，這便是比較正確的煙薰紙的速率了。

既知煙薰紙的速率，於是利用"絕對音值曲線片"[1]，求出M點。　聯絡兩邊的M點，作一水平線，更依曲線片右邊所附小尺作點，兩兩以直線聯絡之（距離聲調曲線過遠之線可以從省），於是得出第三圖。　在這個圖上，聲調起落的絕對音值已可看

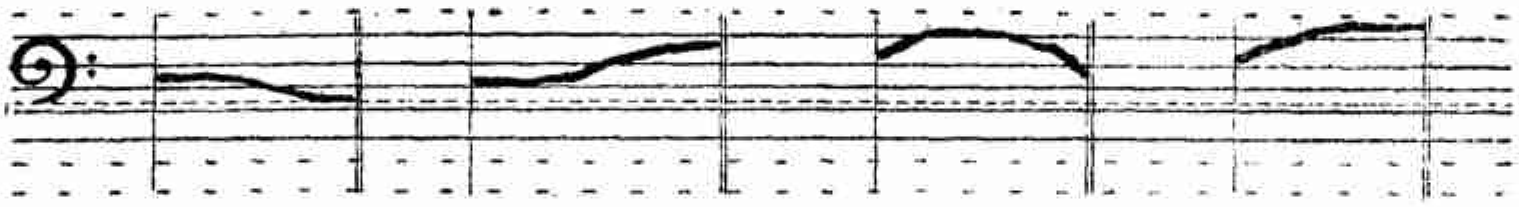
第　三　圖

出，只是線條太密 ，閱覽不便 ，就再用一種"能於正確表示音值的五線譜"[2]影描下來，"於是聲調起落線的絕對音值，就藉着五線譜完全表顯出來了"[2]。　如第四圖。

(1) 關於"絕對音值曲線片"用法，亦見劉先生文中，請參閱。

(2) 均劉先生文中語，請參閱。

第　四　圖



我們還要在五線譜下記載時間。　我們已然知道煙薰紙的速率是每秒鐘 112 *mm.*，則每秒之十分之一爲11.2 *mm.*，於是在五線譜下，利用乙二聲調推斷尺的 Vernier 幫助[1]，自曲線左邊的垂直線起，每隔 11.2 *mm.* 處作點，則第一點爲一秒的十分之一；第二點爲一秒的十分之二；……這樣依次點下來，一直到右邊的垂直線止。　然後用 0.1　0.2 …… 標明，於是長安聲調的起落圖就這樣完成了。

劉先生又說：

> "圖中以十分之一秒爲單位；在比較[illegible]計音長時，却以借用物理學中以一秒的一千分之一爲單位更方便，因爲用了這樣的一個小單位，就可以免去用小數的麻煩了。　這單位的名稱叫做 σ（Sigma）。　我們可以說，圖中的 0.1 是一百個 σ，0.2是二百個 σ[2]。"

因此我又用 σ 表示他的時值。　其法，先量出每個聲調曲線的長度，以速率的千分之一除之，卽得各聲調的 σ 數。　如長安

陰平　$17mm. \div \frac{112}{1000} mm. = 152\ \sigma$

陽平　$21mm. \div \frac{112}{1000} mm. = 188\ \sigma$

上聲　$18mm. \div \frac{112}{1000} mm. = 161\ \sigma$

去聲　$16mm. \div \frac{112}{1000} mm. = 143\ \sigma$

玆就推斷長安聲調所得結果，繪一完全圖式如下：

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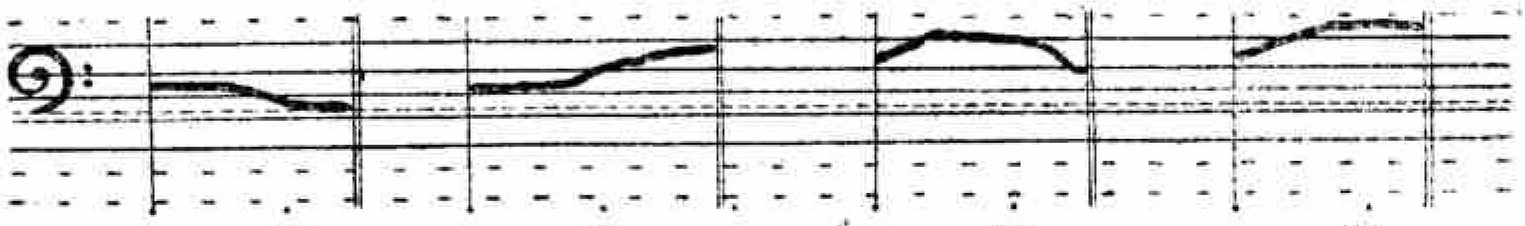
(1) 詳見劉先生原文

(2) 見劉先生文注12。

第 五 圖



0·1 烏　　0·1 吳　　0·1 五　　0·1 誤

煙薰紙速率每秒112*mm.*

陰平	e —c	浪線長	17*mm.*	時間	152 σ
陽平	d#—g#	浪線長	21*mm.*	時間	188 σ
上聲	g—a—f	浪線長	18*mm.*	時間	161 σ
去聲	g —b	浪線長	16*mm.*	時間	143 σ

丙. 實測結果

關中聲調的調類和北方官話中大部分的調類一樣，就是祇有“陰平”“陽平”“上聲”“去聲”四種。 若拿他來和古四聲作一種比較的說明，就須要牽涉到古聲紐和聲調的交互關係。 大抵古四聲“平上去入”，因聲紐清濁之不同，可以各分爲二，因而總共有八聲。 而現在關中則分別合併，僅存四聲。 這種錯綜變化的關係大致如此：

1. 古全清　幫，非，端，知，見，照，精，心，審，曉，影和次清滂，敷，透，徹，溪，穿，淸等紐的字，古平上去今各成一類，呼之曰陰平，上聲，去聲。
2. 古全濁　並，奉，定，澄，羣，從，邪，牀，禪，匣及次濁之喻紐的字古平聲今讀清紐，另成一類，呼之曰陽平，古上去今讀清紐去聲。
3. 古次濁　微，明，泥，娘，疑，來，日，等紐的字古平聲今讀陽平，古上去與淸紐上去無別。
4. 古入聲　聲尾消失，調勢引長，變讀規律是“全濁變陽，其餘變陰[1]”。

這當然是指大致規律而言，一兩例外，在所難免。 如儀字應讀陽平，但在關中區多數人讀作去聲；又如培字應讀陽平，但在關中很有人讀作上聲。 本文以記述調值爲主，關於聲調古今分合，僅能撮其大要，凡涉瑣屑之點，即不一一備列。

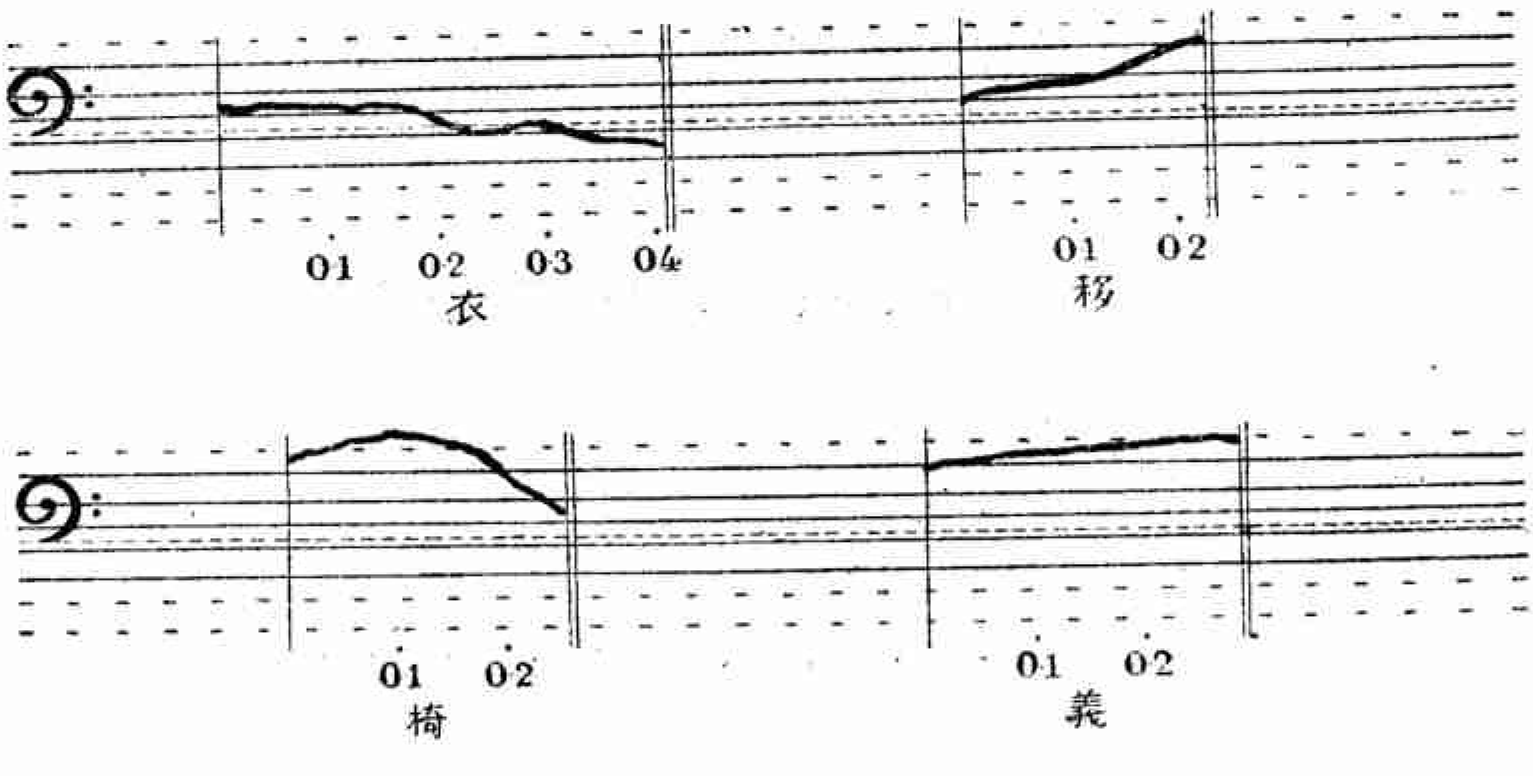
(1) 請參閱拙作關中入聲之變化一文，載中央研究院歷史語言研究所集刊外編下册。

又本文中所實驗的四聲，都是一個字一個字單念，而且是一個調一個調讀得很淸楚的。 這與日常說話時所用的聲調並不全同。 第一，說話時的聲音很自然，而在儀器上發音時不免矜持。 第二，說話時詞類相連，聲調本身還有變化，而在讀單字時則不然。 因此我現在實驗的聲調，可以說是單字的聲調，並沒有涉及語調。 這是要預先聲明的。

以下便是關中三十九縣聲調實驗的結果。 例字是衣，烏，迂，剛(陰平)；移，吳，魚，陳，驢(陽平)；以，已，椅，五，雨，古(上聲)；義，誤，遇，道，近（去聲)。每縣大抵用一組：或"衣，移，椅（以已)，義"；或"烏，吳，五，誤"；或"迂，魚(驢)，雨，遇"；或"剛，陳，古，道(近)"。 間有因讀調錯誤，或浪紋不淸，改用他組一兩個字的。

長安聲調已見上文，茲從略。

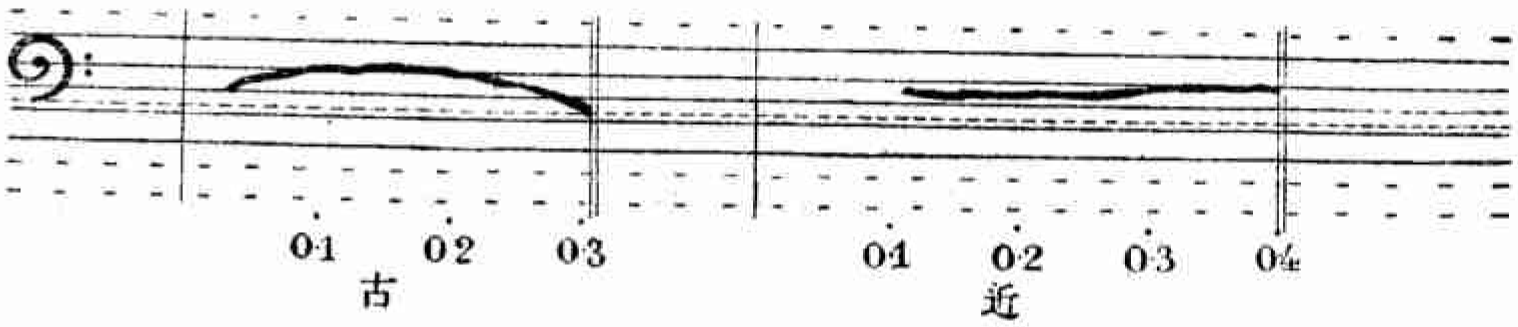
藍 田 聲 調



煙薰紙速率每秒95*mm.*

陰平	e——A#	浪線長38 *mm.*	時間400 σ
陽平	d——a	浪線長20.3*mm.*	時間214 σ
上聲	b—d'——e	浪線長23.5*mm.*	時間247 σ
去聲	a——c'	浪線長26.5*mm.*	時間279 σ

雒 南 聲 調



烟薰紙速率每秒109*mm.*

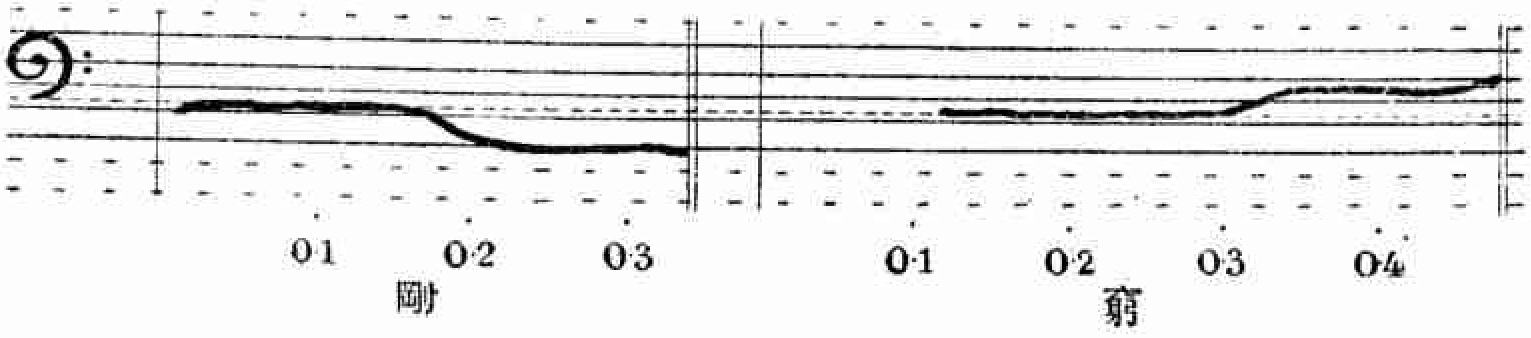
陰平　f#——B　浪線長41.5*mm.*　時間381 σ

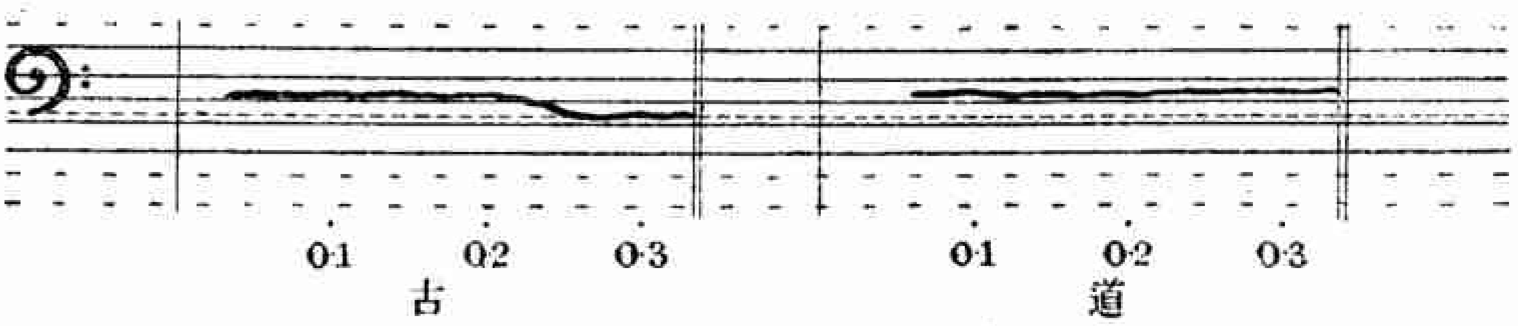
陽平　e——a　浪線長51 *mm.*　時間468 σ

上聲　d—f——c　浪線長34 *mm.*　時間312 σ

去聲　e——f　浪線長43.8*mm.*　時間402 σ

商 縣 聲 調





烟薰紙速率每秒128*mm.*

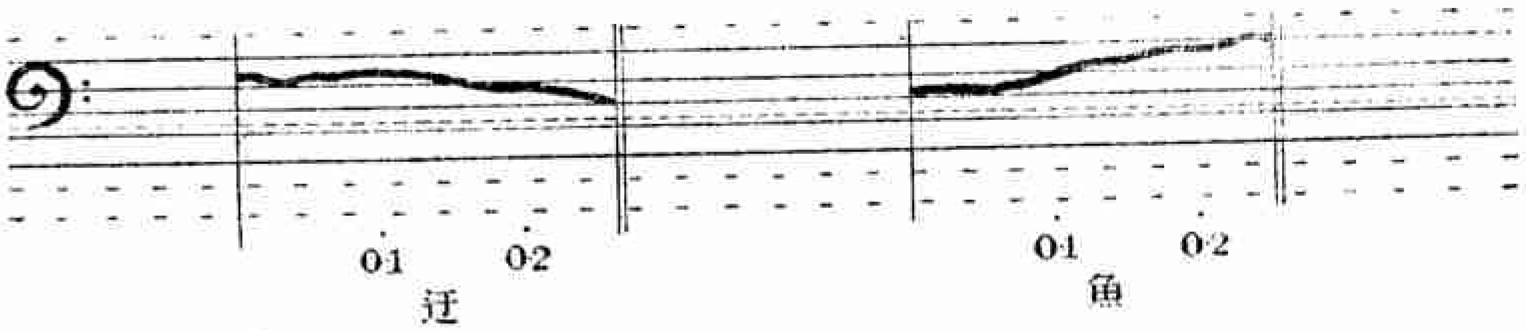
陰平　B—c——G　浪線長 44*mm.*　時間344 σ

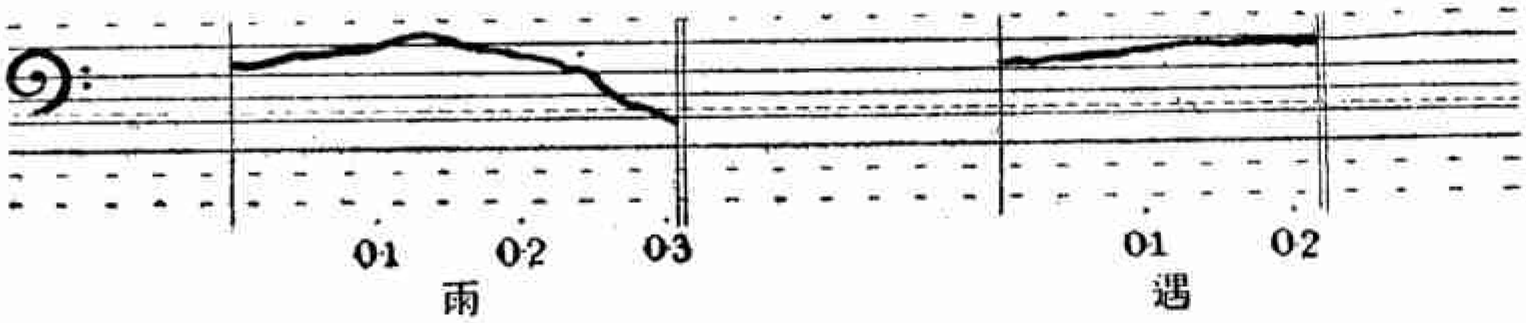
陽平　　c——f　　浪線長61.7*mm.*　　時間482 σ

上聲　d# ——c　　浪線長43.3*mm.*　　時間338 σ

去聲　d# ——d#　浪線長43.5*mm.*　　時間340 σ

滝　關　聲　調





烟薫紙速率每秒120*mm.*

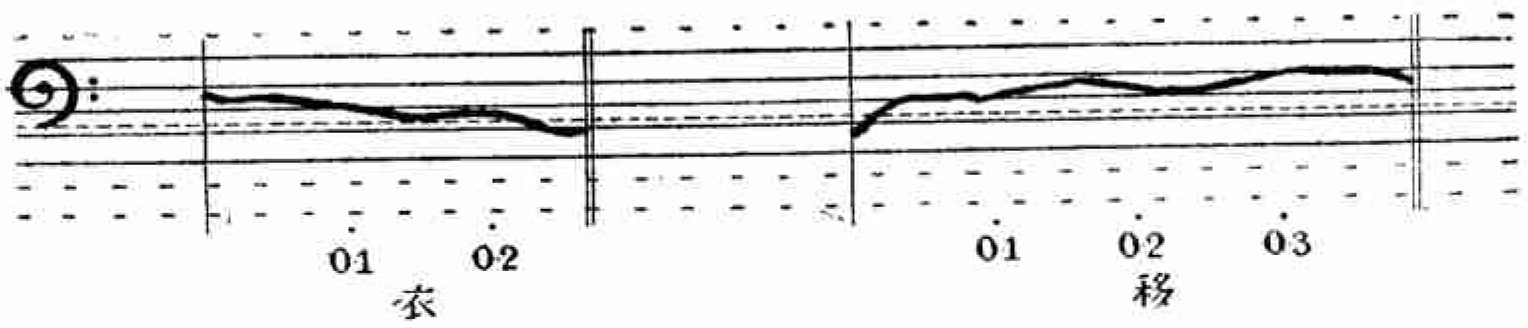
陰平　　f# ——d　　浪線長31.7*mm.*　　時間264 σ

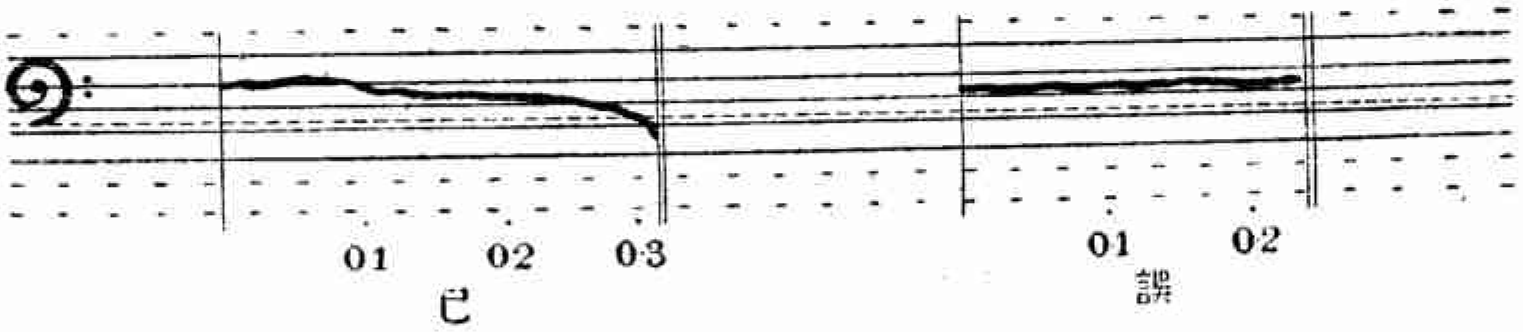
陽平　　d# ——a　　浪線長30.3*mm.*　　時間253 σ

上聲 g—a# ——B　浪線長37.9*mm.*　　時間316 σ

去聲　　f# ——a　　浪線長26.9*mm.*　　時間224 σ

華　陰　聲　調

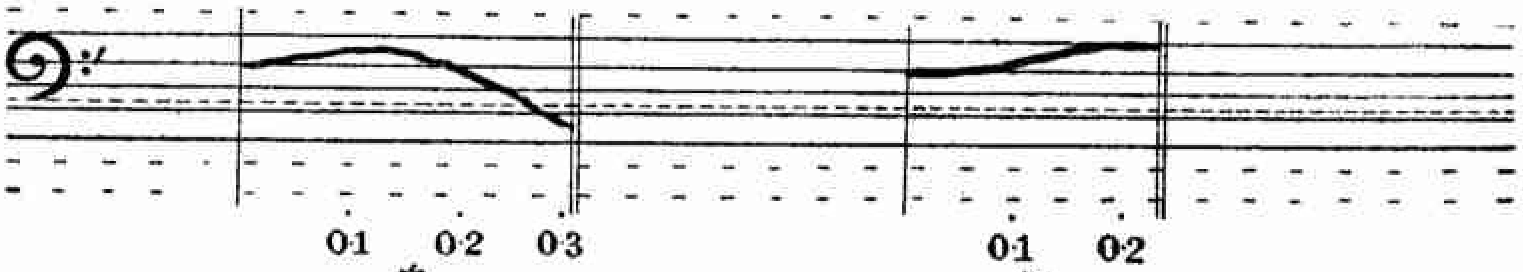




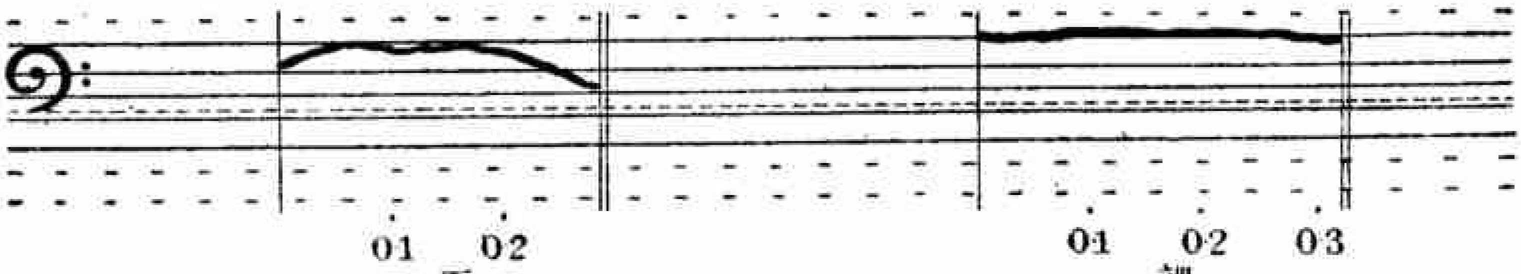
烟薰紙速率每秒127*mm.*

陰平	e——B	浪線長32.1*mm.*	時間253 σ
陽平	A——d#	浪線長46.8*mm.*	時間369 σ
上聲	f——A#	浪線長37.1*mm.*	時間292 σ
去聲	d# ——d#	浪線長29 *mm.*	時間228 σ

華縣聲調



烏　　　　吳

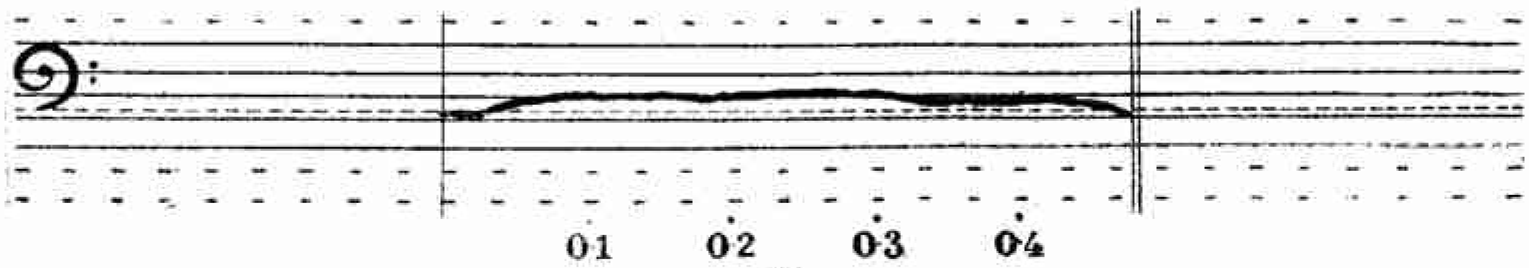


五　　　　誤

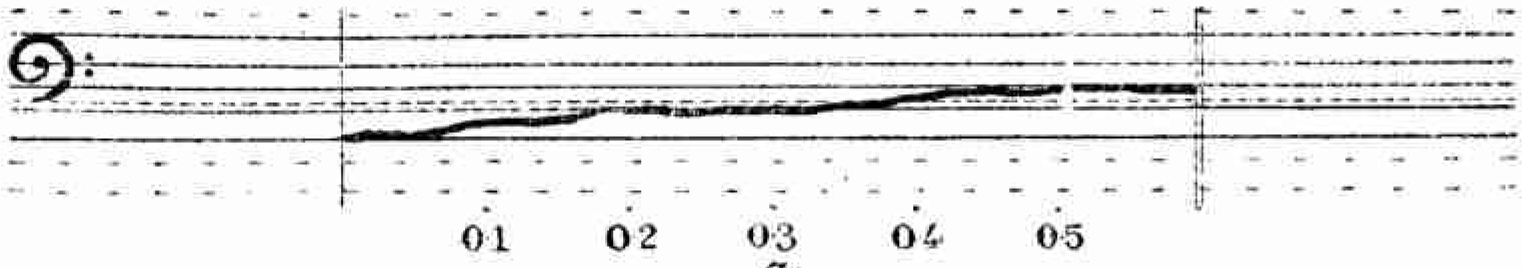
烟薰紙速率每秒90*mm.*

陰平	f—g——A#	浪線長27.3*mm.*	時間303 σ
陽平	f——a	浪線長21 *mm.*	時間233 σ
上聲	f# —a——d#	浪線長26.6*mm.*	時間296 σ
去聲	a——a	浪線長30 *mm.*	時間333 σ

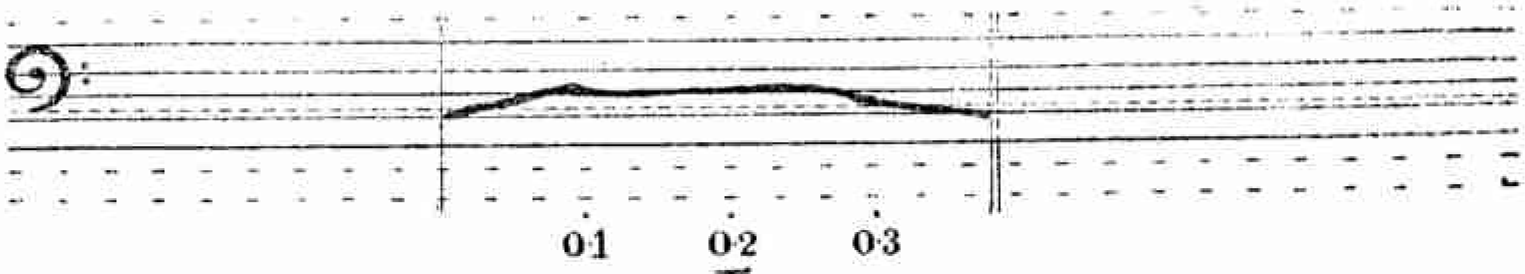
渭南聲調



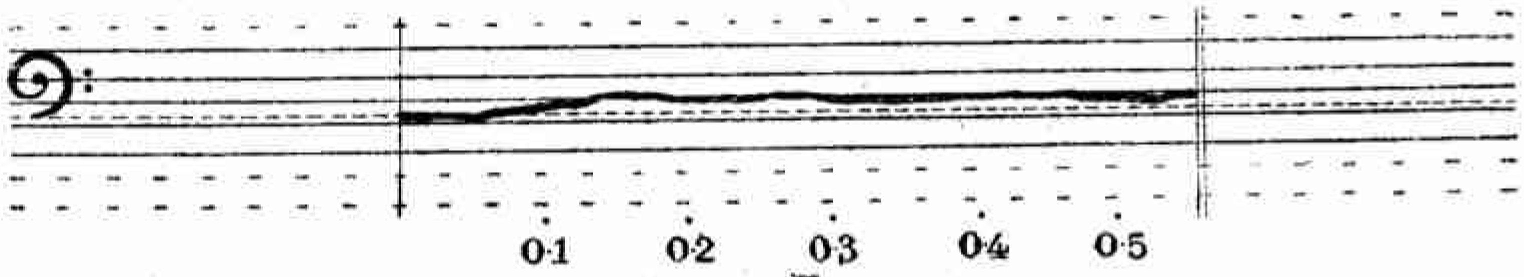
迂



魚



雨

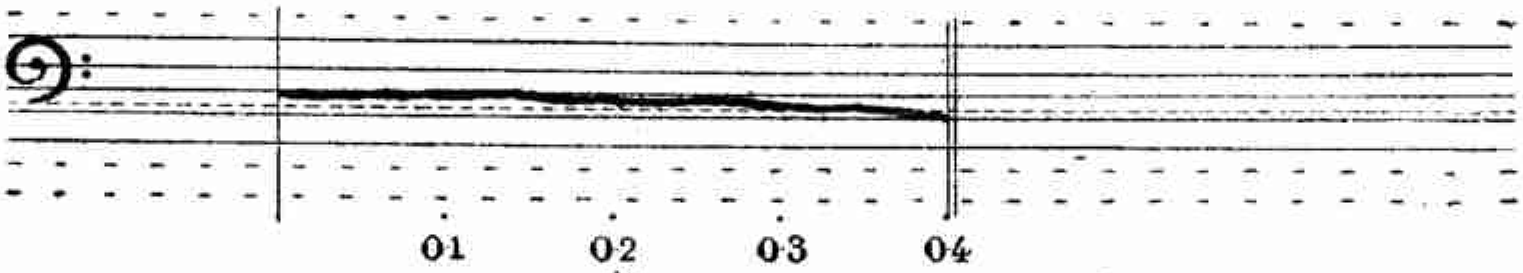


遇

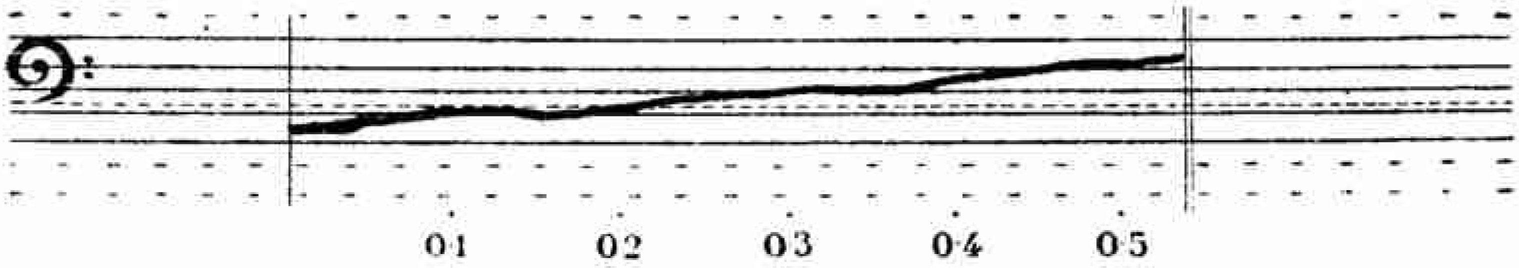
烟薰紙速率每秒123*mm.*

陰平	c—d——B	浪線長58 *mm.*	時間472 σ
陽平	G——d	浪線長71.9*mm.*	時間585 σ
上聲	B—d# ——B	浪線長46 *mm.*	時間374 σ
去聲	c——d	浪線長66.9*mm.*	時間544 σ

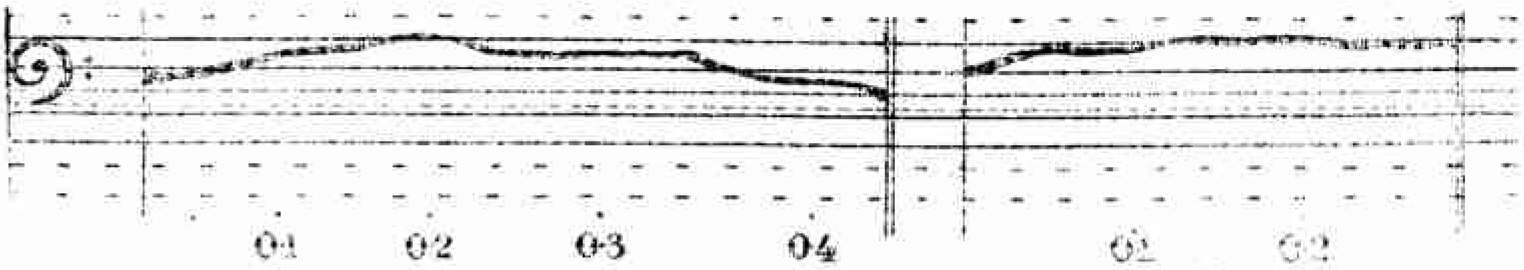
臨 潼 聲 調



衣



移

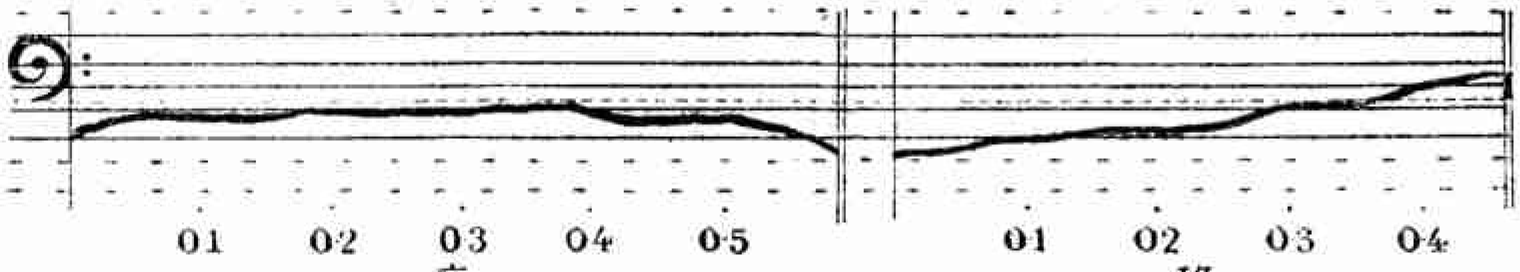


已　　誼

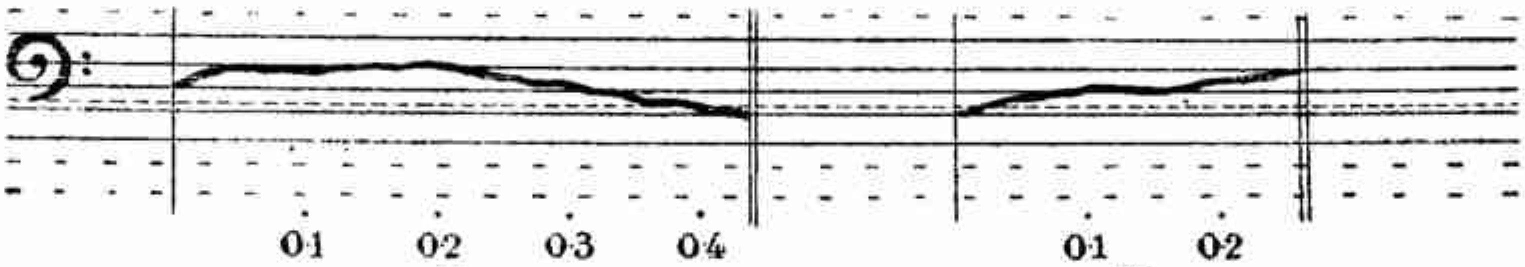
烟薰紙速率每秒142*mm.*

陰平	d——B	浪線長56 *mm.*	時間394 σ
陽平	A——g	浪線長76 *mm.*	時間535 σ
上聲	e—a——d	浪線長62 *mm.*	時間437 σ
去聲	f——a	浪線長41 *mm.*	時間289 σ

三 原 聲 調



衣　　移

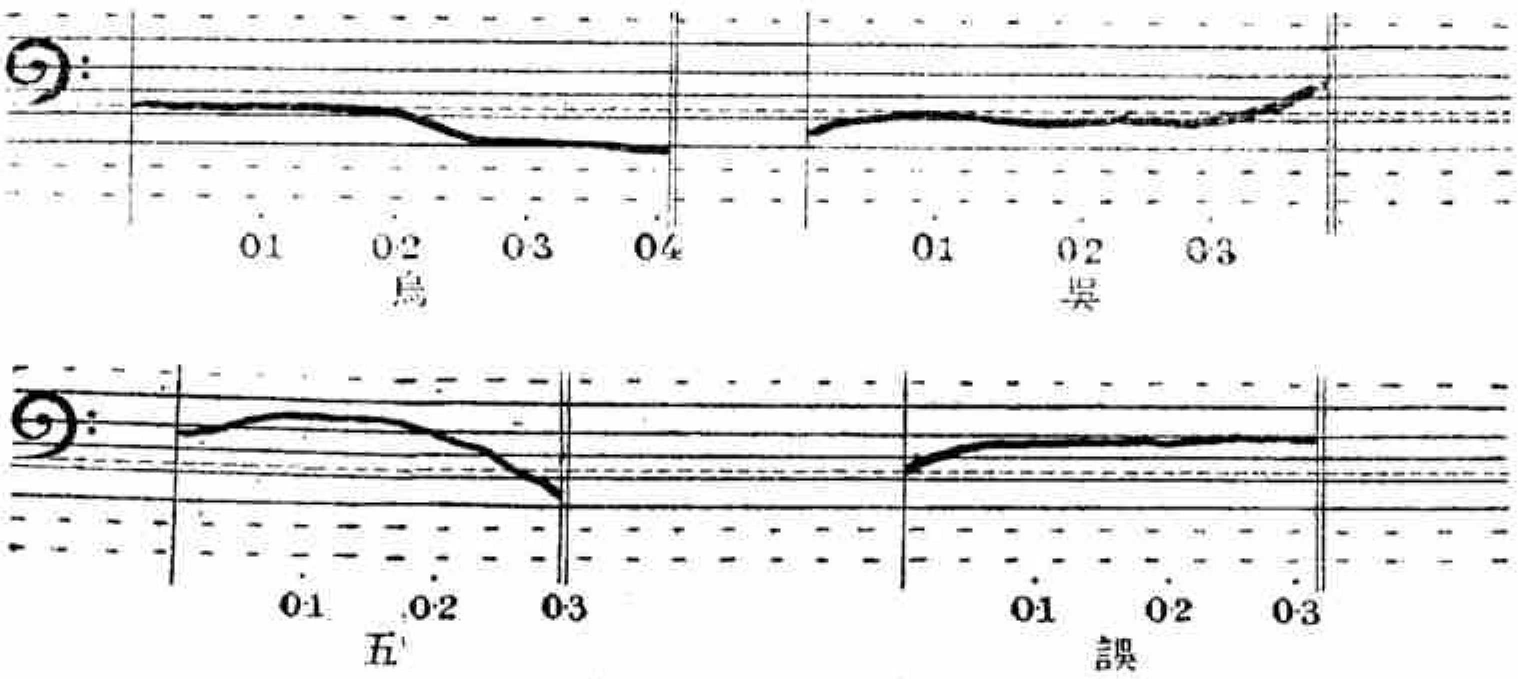


已　　義

烟薰紙速率每秒109*mm.*

陰平	G—B——F	浪線長64.5*mm.*	時間592 σ
陽平	F——e	浪線長51.2*mm.*	時間470 σ
上聲	d—f——B	浪線長48 *mm.*	時間441 σ
去聲	B——f	浪線長29 *mm.*	時間266 σ

朝邑聲調



烟薰紙速率每秒118*mm.*

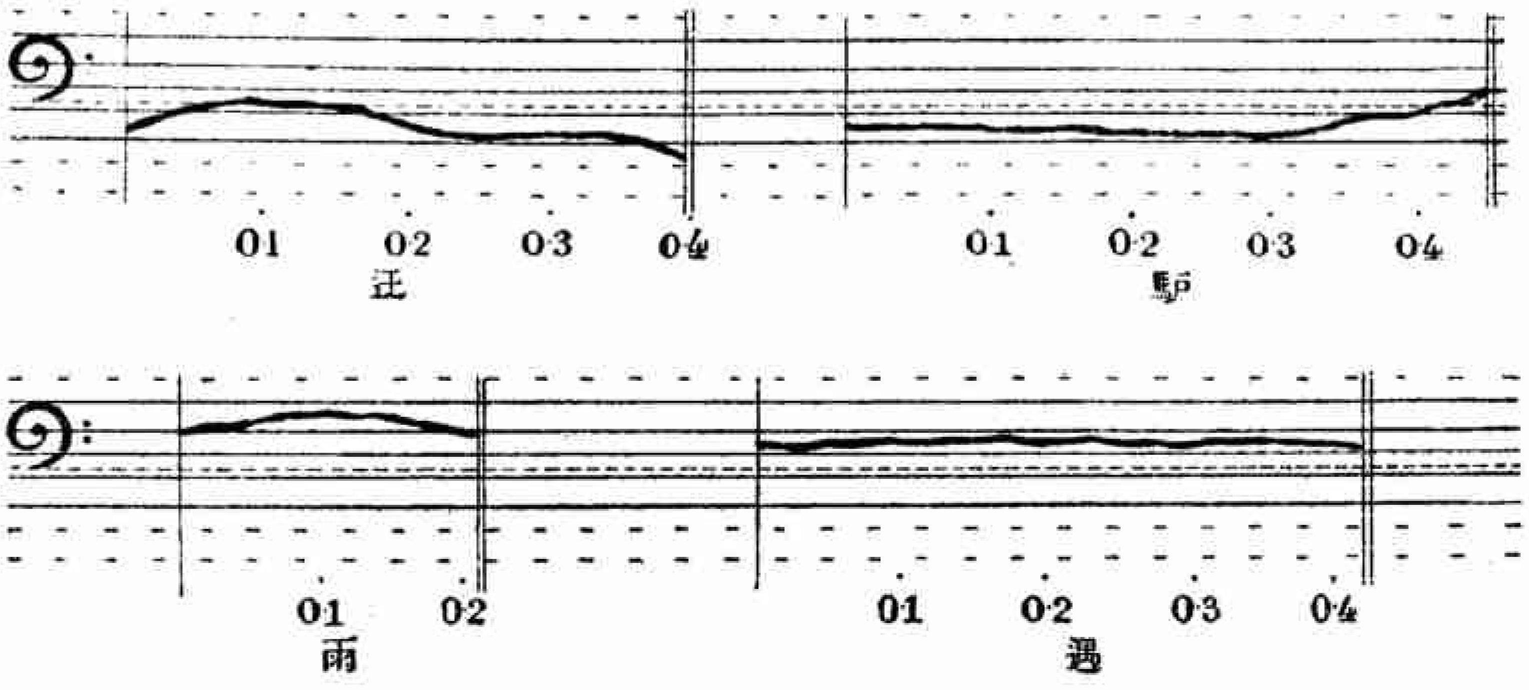
陰平　c——G　浪線長45.1*mm.*　時間382 σ

陽平　A——e　浪線長43.6*mm.*　時間369 σ

上聲　e—g——A　浪線長32.5*mm.*　時間275 σ

去聲　c——f　浪線長34.6*mm.*　時間293 σ

大荔聲調



烟薰紙速率每秒128*mm.*

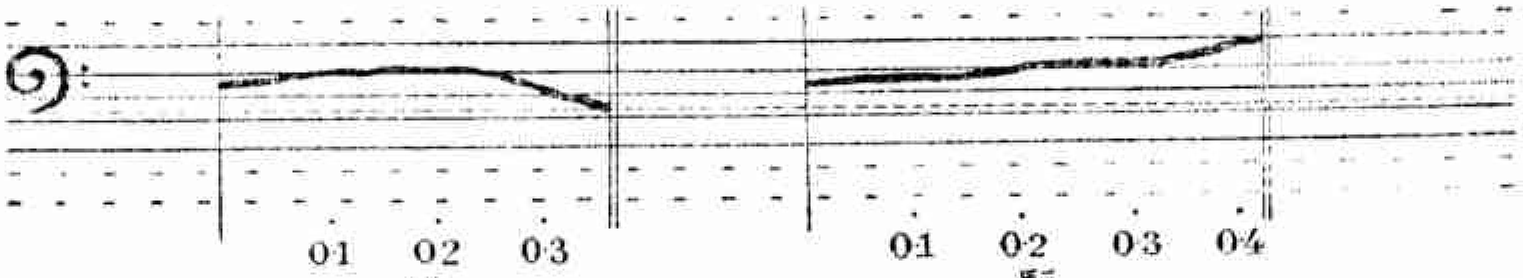
陰平　A—c——F　浪線長47　*mm.*　時間367 σ

陽平　A——d　浪線長54　*mm.*　時間427 σ

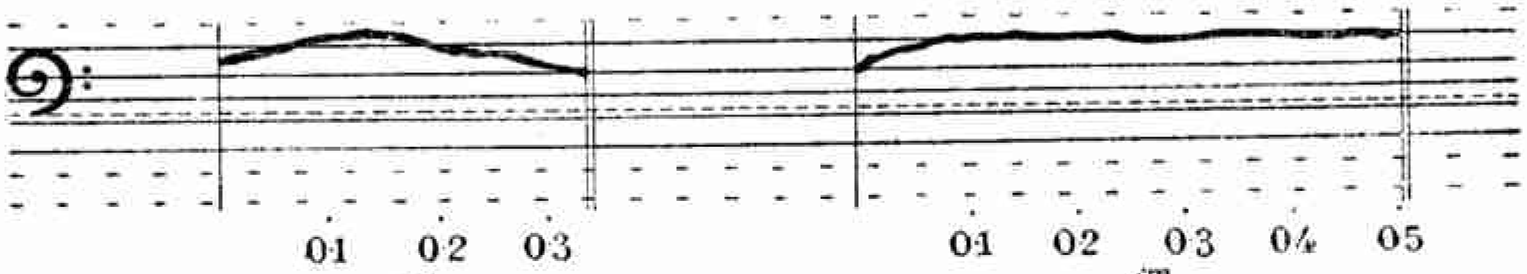
上聲　f—g——f　浪線長24.5*mm.*　時間191 σ

去聲　c——c　浪線長50 *mm.*　時間391 σ

郃 陽 聲 調



迂　馿



雨　遇

烟薰紙速率每秒90*mm.*

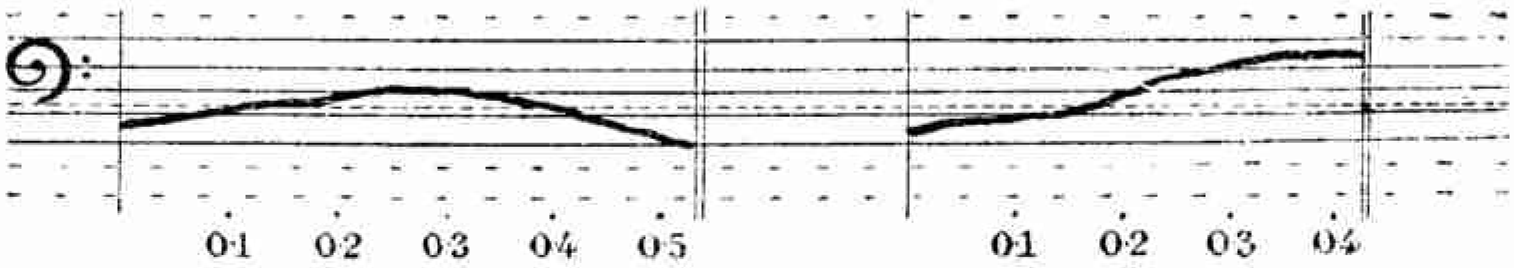
陰平　e—f——c　浪線長32.5*mm.*　時間361 σ

陽平　e——a　浪線長38 *mm.*　時間422 σ

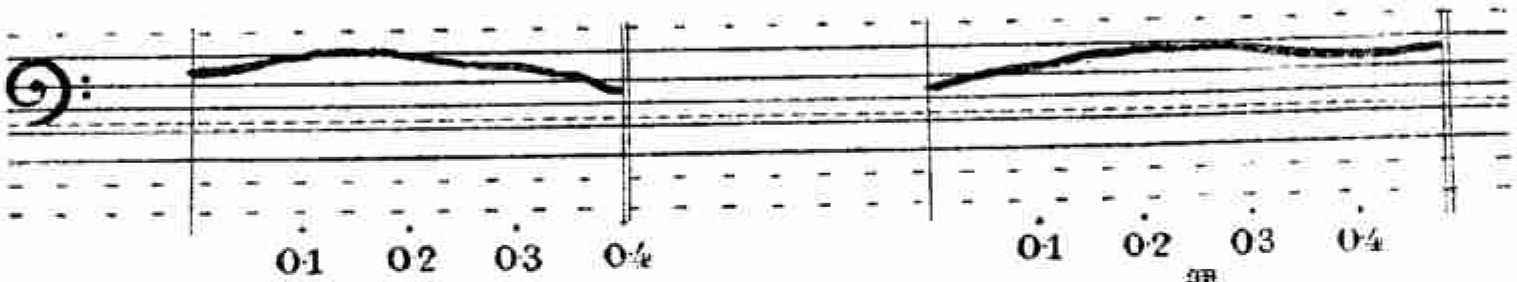
上聲　g#—b—f　浪線長30.5*mm.*　時間339 σ

去聲　f——a　浪線長45 *mm.*　時間500 σ

韓 城 聲 調



迂　馿

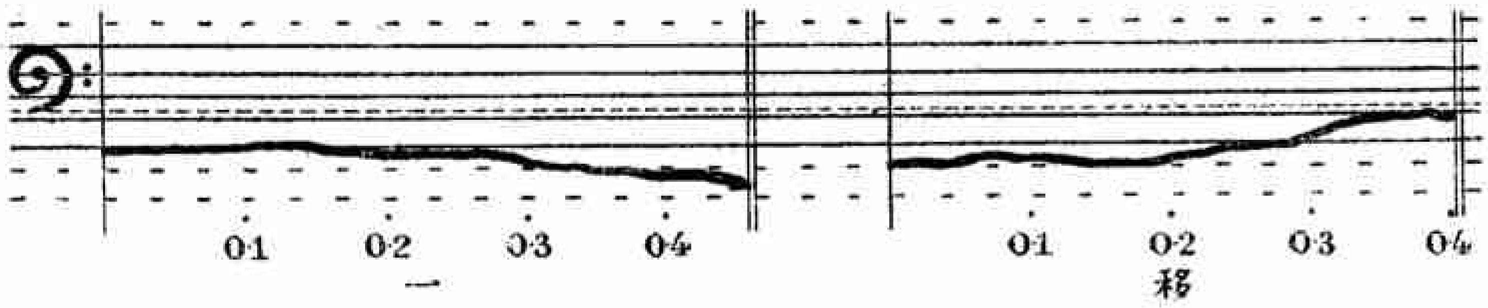


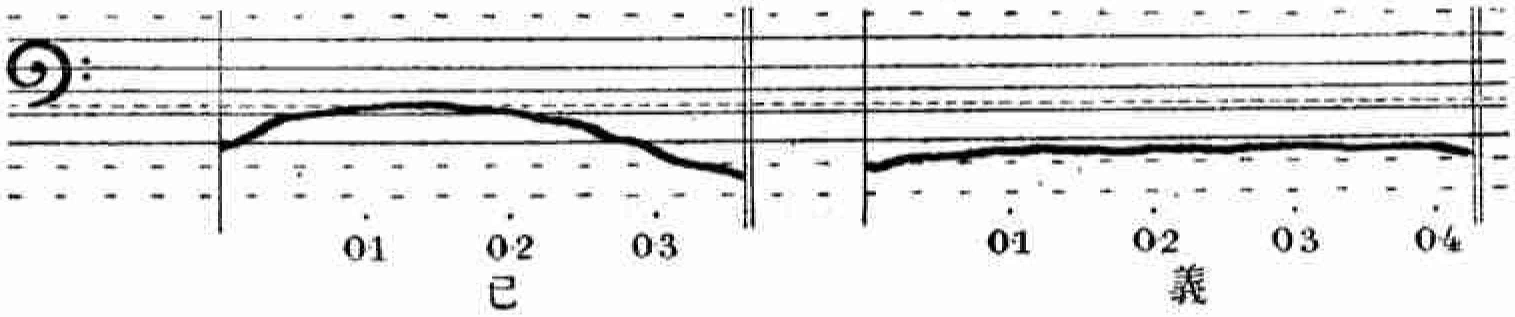
雨　遇

烟薰紙速率每秒98*mm.*

陰平	A#--d——G	浪線長54.6*mm.*	時間557 σ
陽平	A——g	浪線長38 *mm.*	時間388 σ
上聲	g—a——e	浪線長36 *mm.*	時間367 σ
去聲	e——g	浪線長43.7*mm.*	時間446 σ

蒲 城 聲 調

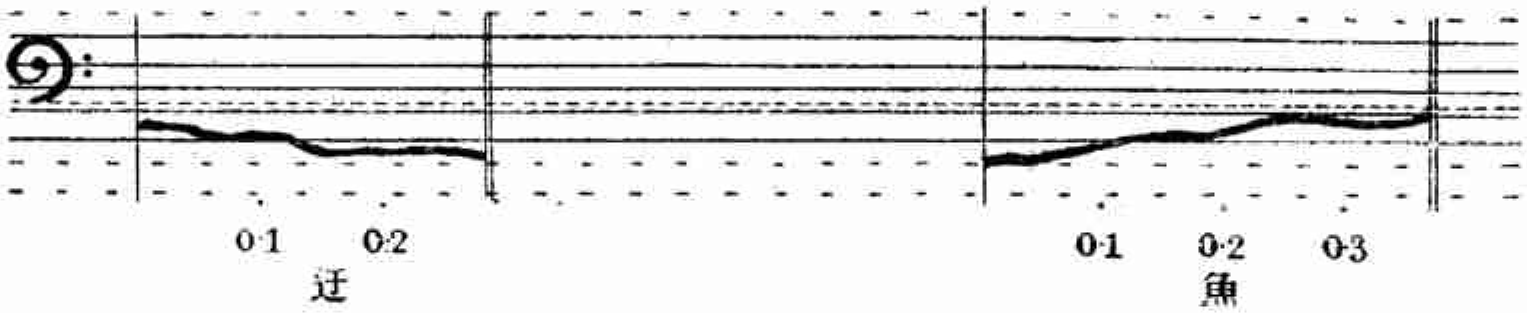


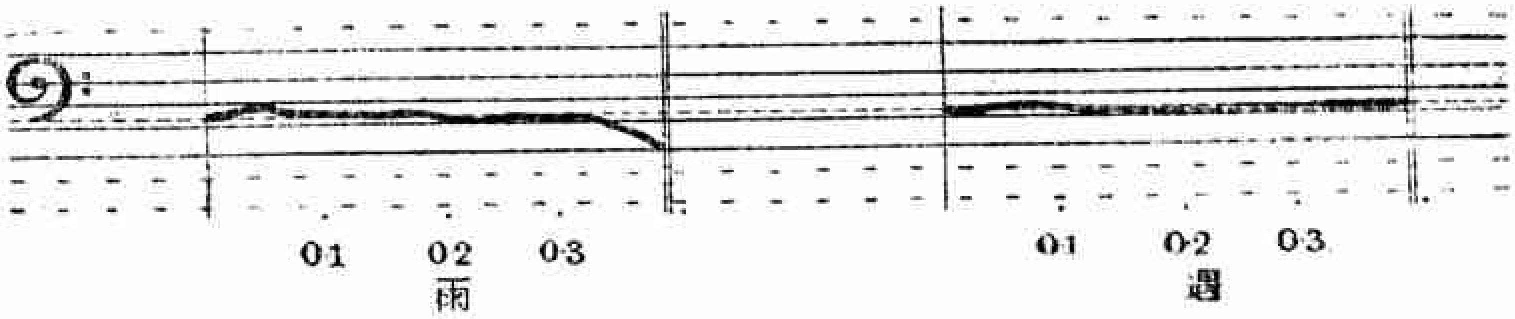


烟薰紙速率每秒123*mm.*

陰平	G ——D	浪線長55 *mm.*	時間447 σ
陽平	E ——B	浪線長48.9*mm.*	時間399 σ
上聲	G—c——D	浪線長44.2*mm.*	時間359 σ
去聲	E——F	浪線長51.3*mm.*	時間417 σ

白 水 聲 調

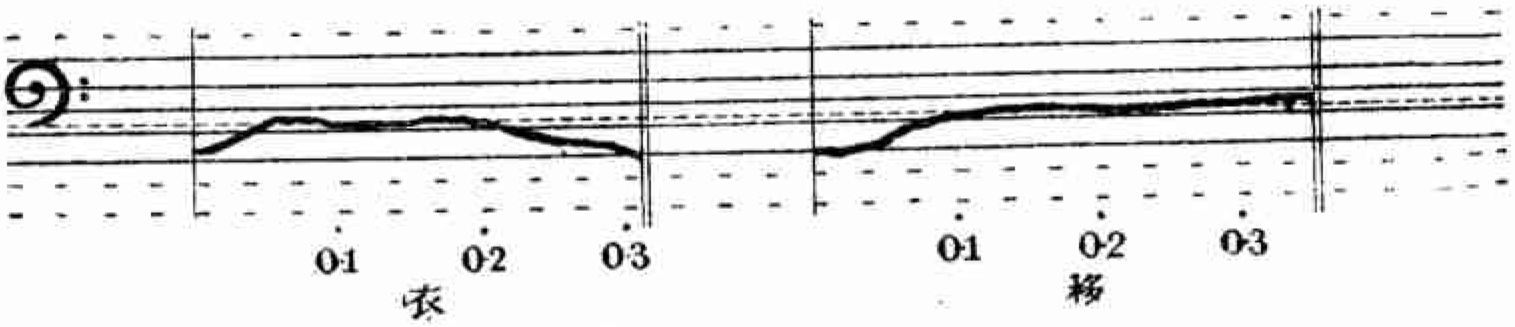


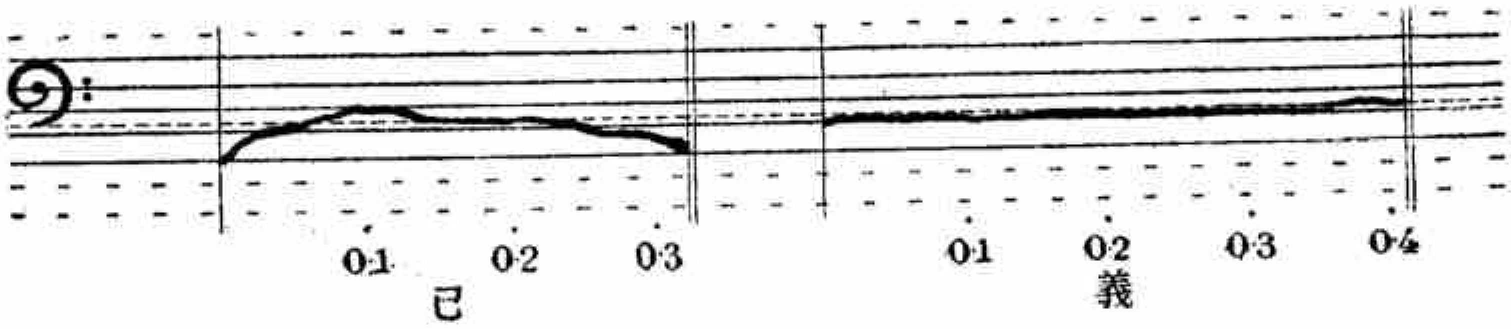


烟薰紙速率每秒95*mm.*

陰平	A——F	浪線長29 *mm.*	時間305 σ
陽平	E——B	浪線長52.5*mm.*	時間553 σ
上聲	c—d——G	浪線長37.3*mm.*	時間393 σ
去聲	c——c	浪線長37 *mm.*	時間389 σ

澄 城 聲 調

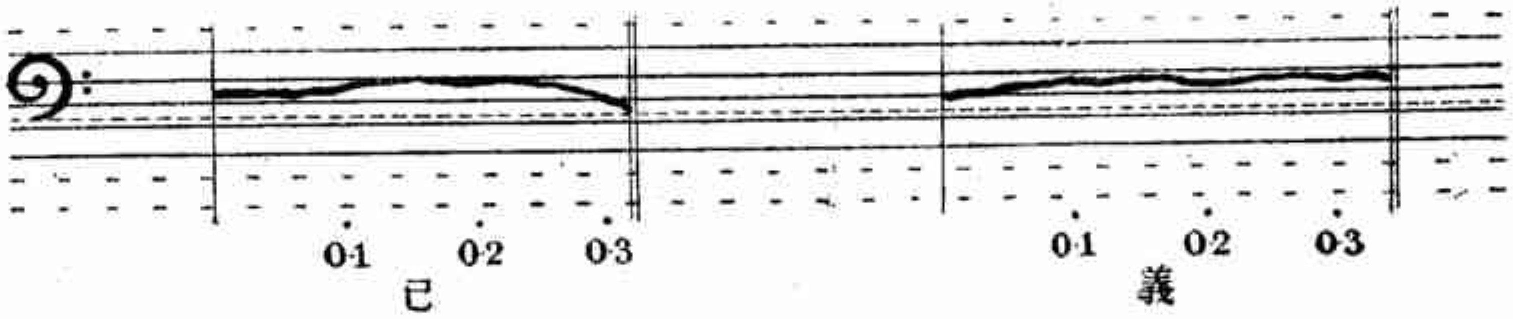




烟薰紙速率每秒123*mm.*

陰平	A—c——G	浪線長37.6*mm.*	時間306 σ
陽平	G——c#	浪線長42.4*mm.*	時間345 σ
上聲	G—d——G	浪線長39.5*mm.*	時間321 σ
去聲	B——c	浪線長49.2*mm.*	時間400 σ

高陵聲調



烟薰紙速率每秒117*mm.*

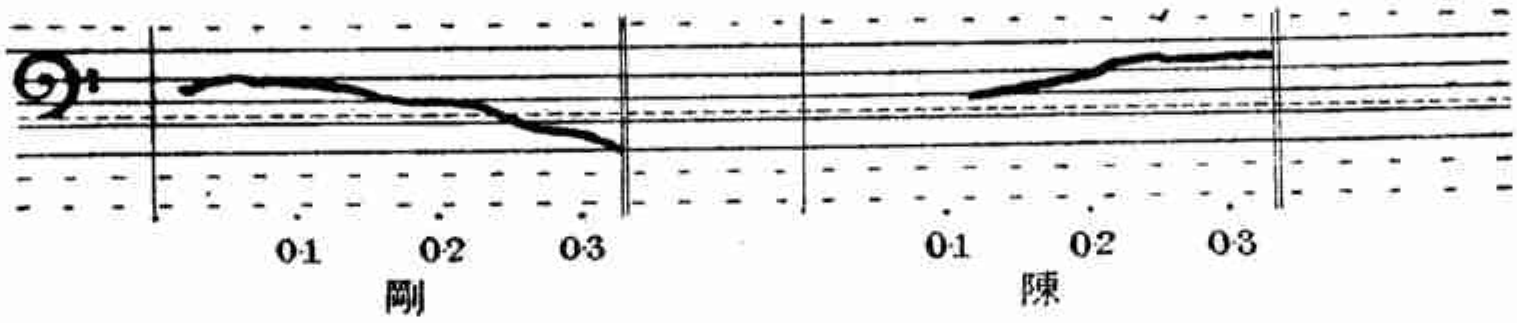
陰平　c#—d#——A#　浪線長43　*mm.*　時間368 σ

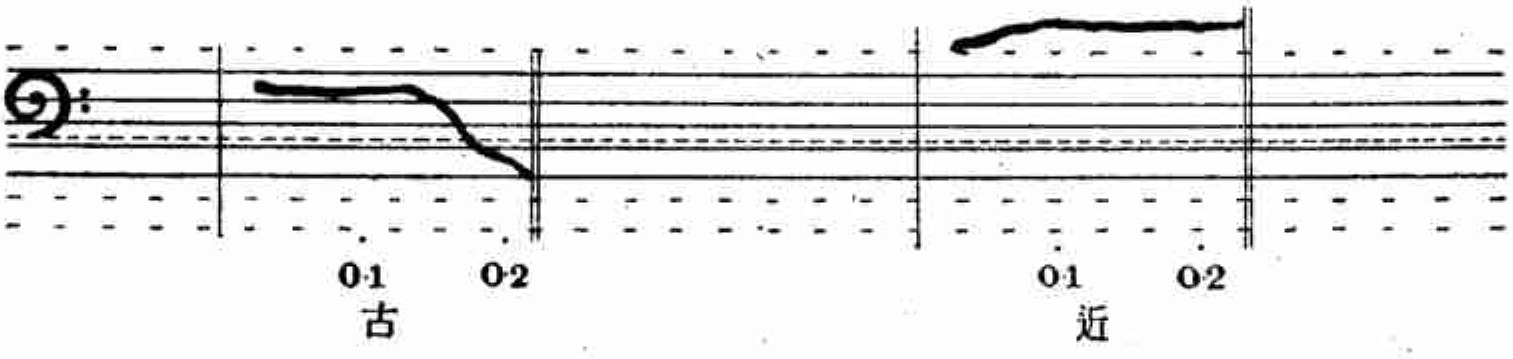
陽平　c#——g　浪線長48　*mm.*　時間410 σ

上聲　e—f——c#　浪線長35　*mm.*　時間299 σ

去聲　d——e　浪線長37.7*mm.*　時間322 σ

富平聲調





烟薰紙速率每秒121*mm.*

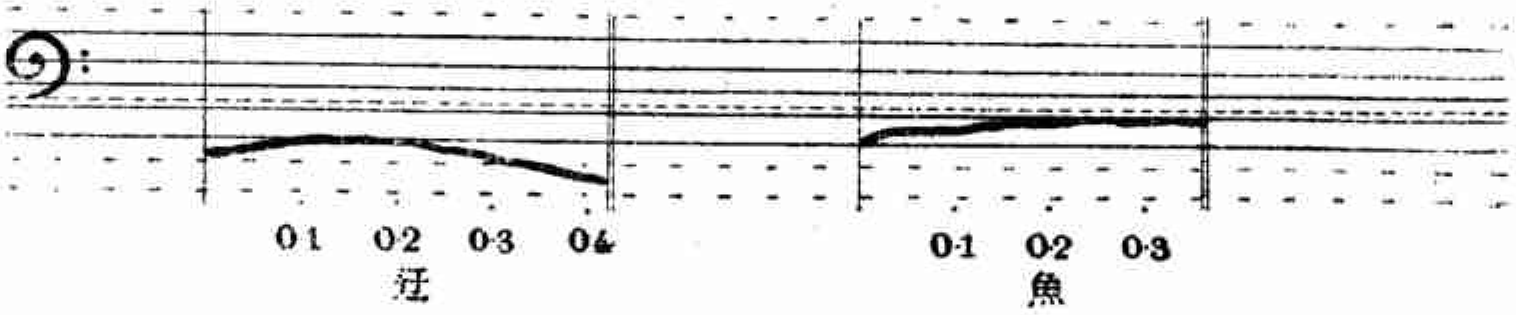
陰平　e—f——G　浪線長26　*mm.*　時間215 σ

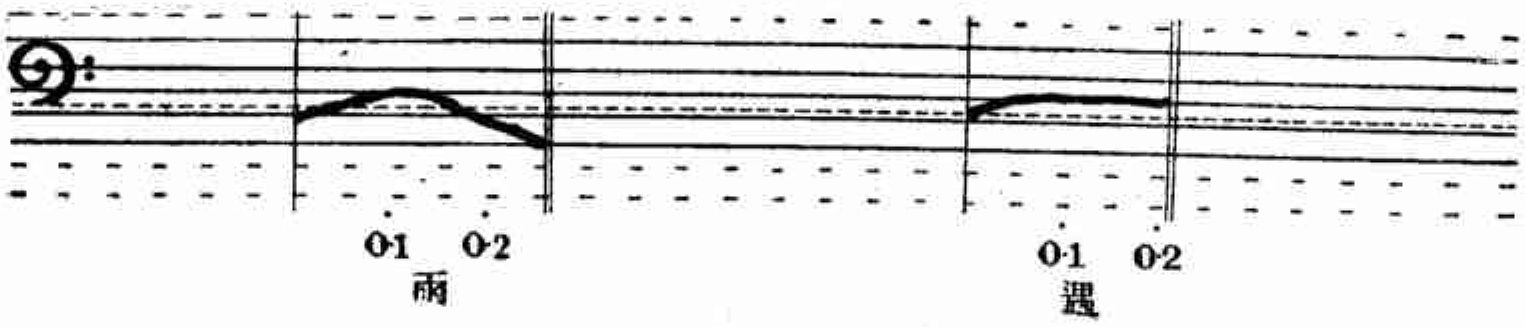
陽平　d——g　浪線長28　*mm.*　時間231 σ

上聲　g—— G　浪線長39.5*mm.*　時間326 σ

去聲　c'—— e'　浪線長40　*mm.*　時間331 σ

涇 陽 聲 調





烟薰紙速率每秒86*mm.*

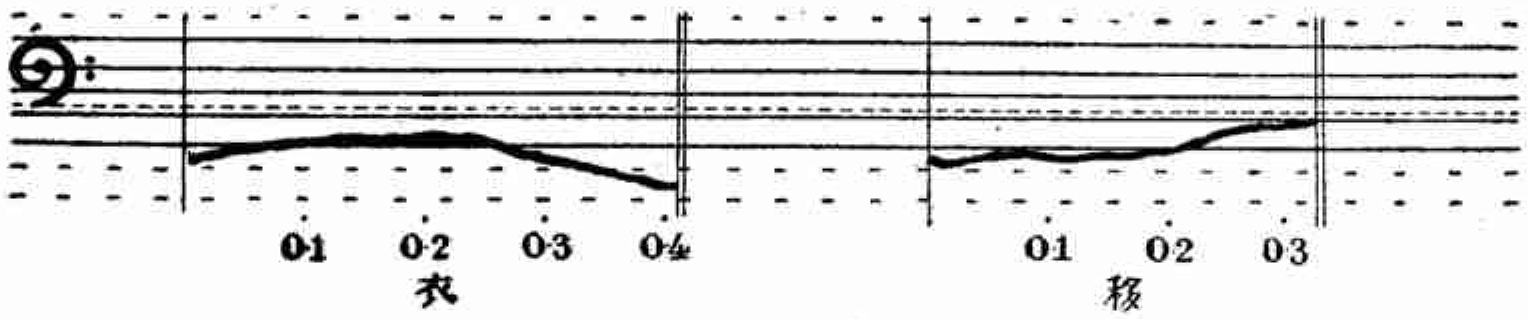
陰平　F—G——D　浪線長34　*mm.*　時間395 σ

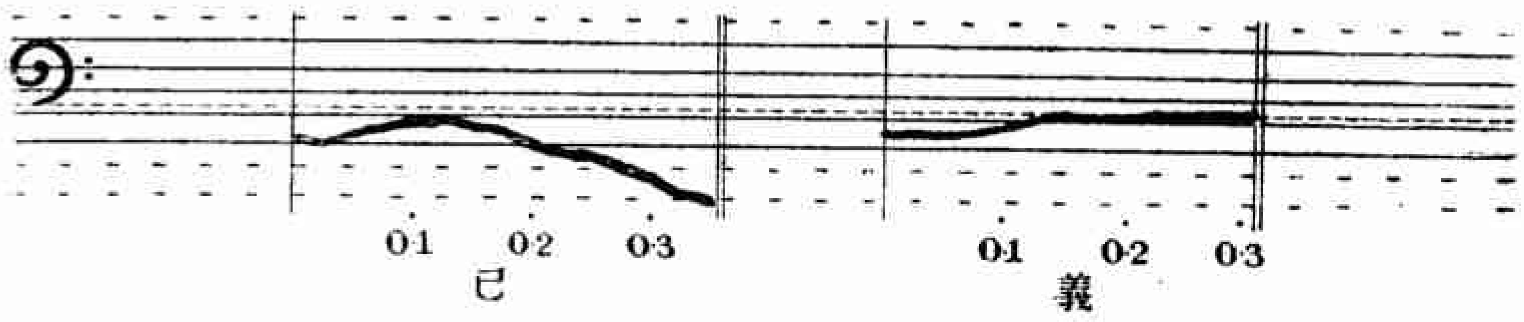
陽平　G——B　浪線長29　*mm.*　時間337 σ

上聲　B—d——G　浪線長21　*mm.*　時間244 σ

去聲　c——d　浪線長17　*mm.*　時間198 σ

鄠 縣 聲 調

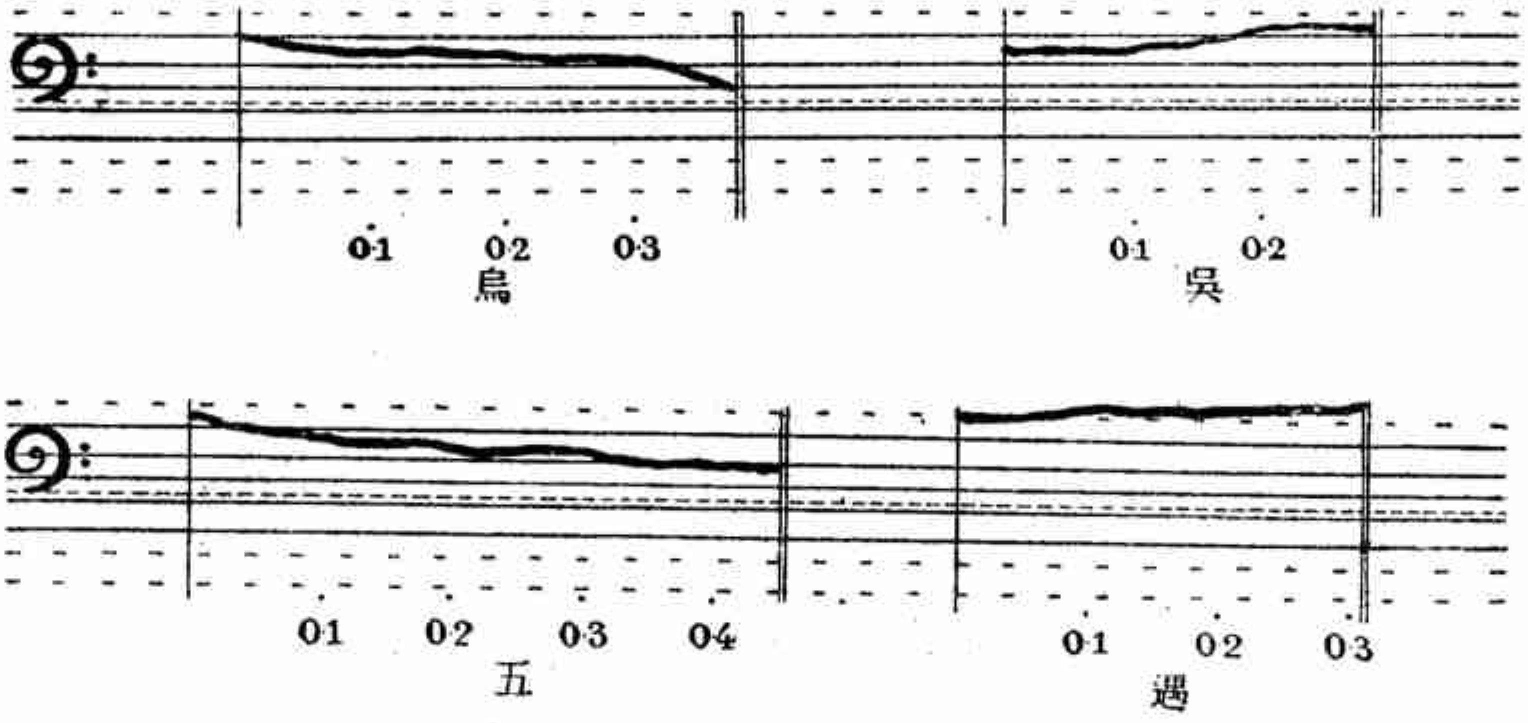




煙薰紙速率每秒99*mm.*

陰平	F—G#——D	浪線長41.2*mm.*	時間416 σ
陽平	F——B	浪線長32.5*mm.*	時間328 σ
上聲	G—B——C	浪線長35.8*mm.*	時間362 σ
去聲	A——c	浪線長31 *mm.*	時間313 σ

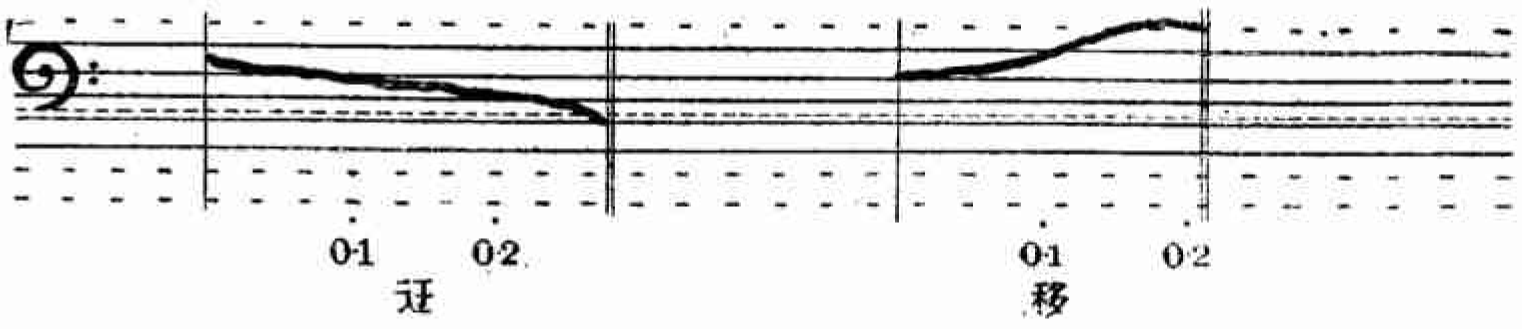
盩 厔 聲 調

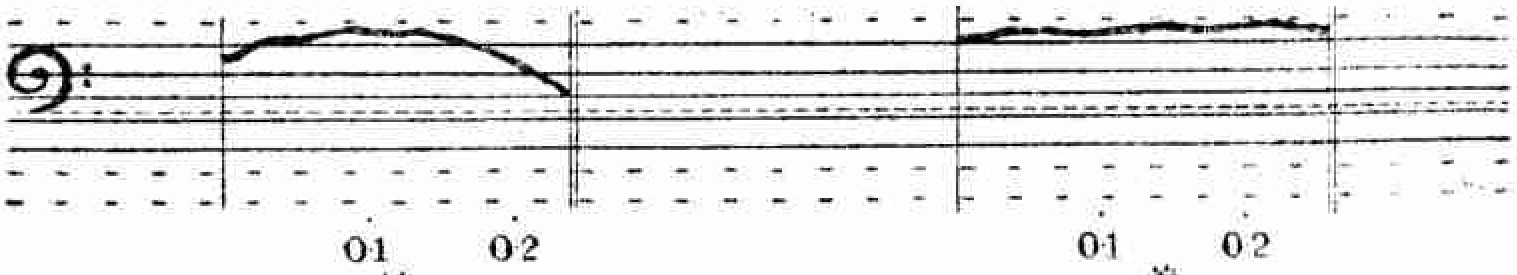


烟薰紙速率每秒111*mm.*

陰平	a——d	浪線長42 *mm.*	時間378 σ
陽平	g——b	浪線長30.5*mm.*	時間275 σ
上聲	b——f	浪線長50 *mm.*	時間451 σ
去聲	c′——d′	浪線長34.2*mm.*	時間308 σ

咸 陽 聲 調



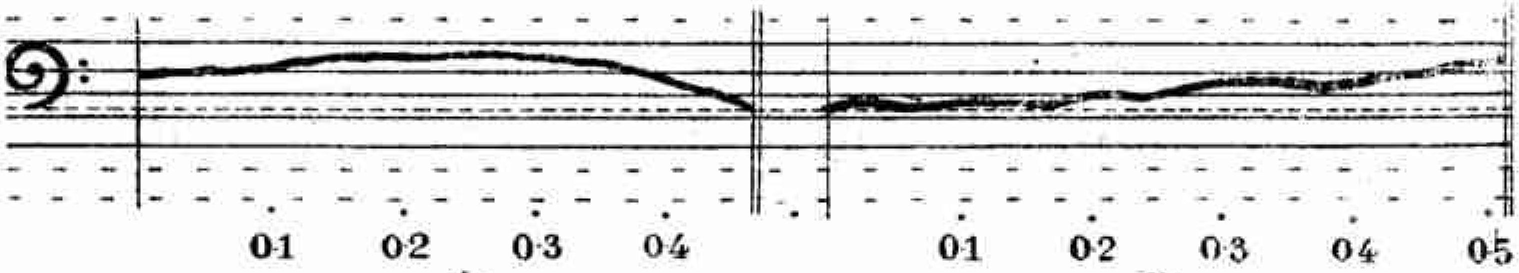


椅　　　　義

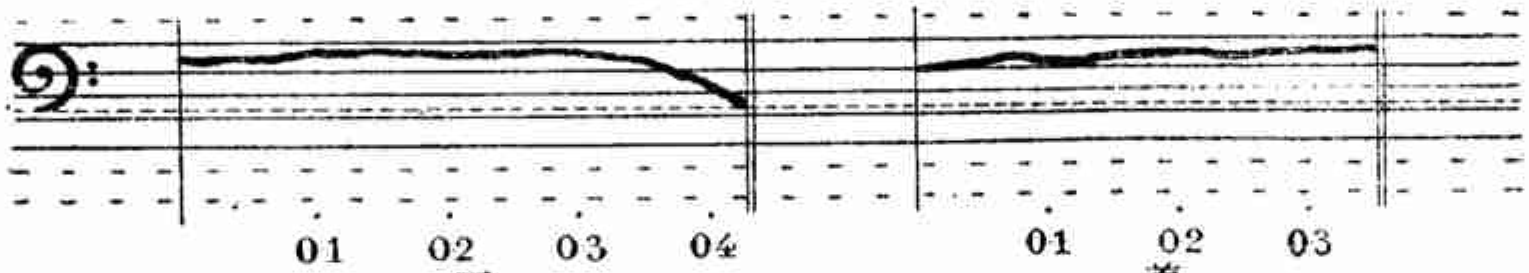
烟薰紙速率每秒120*mm*.

陰平	g——B	浪線長33.5*mm*.	時間279 σ
陽平	f—— c'	浪線長25.9*mm*.	時間216 σ
上聲	g—b——d	浪線長29 *mm*.	時間242 σ
去聲	a——b	浪線長31.2*mm*.	時間260 σ

興 平 聲 調



衣　　　　移

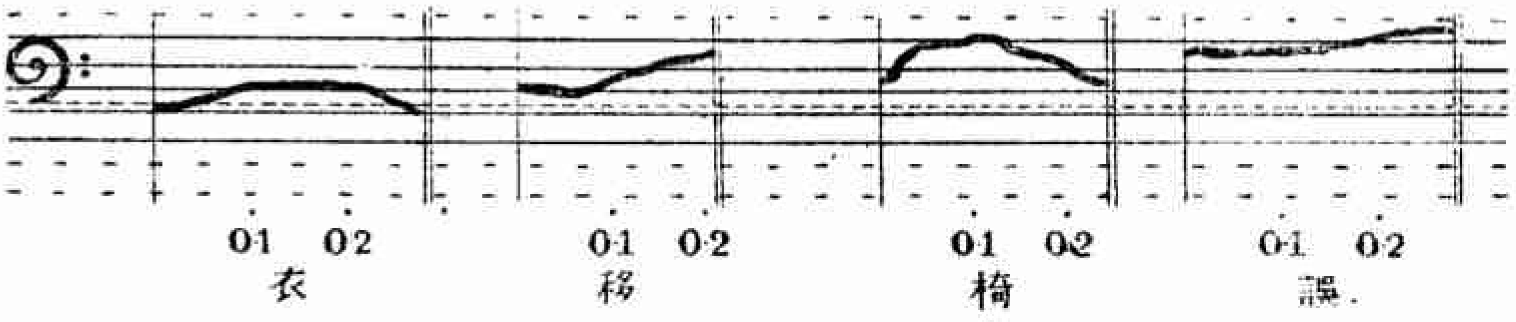


雨　　　　義

烟薰紙速率每秒112*mm*.

陰平	f—g——c	浪線長51.5*mm*.	時間459 σ
陽平	c——g	浪線長57 *mm*.	時間501 σ
上聲	g——c	浪線長47 *mm*.	時間420 σ
去聲	f——g	浪線長39 *mm*.	時間348 σ

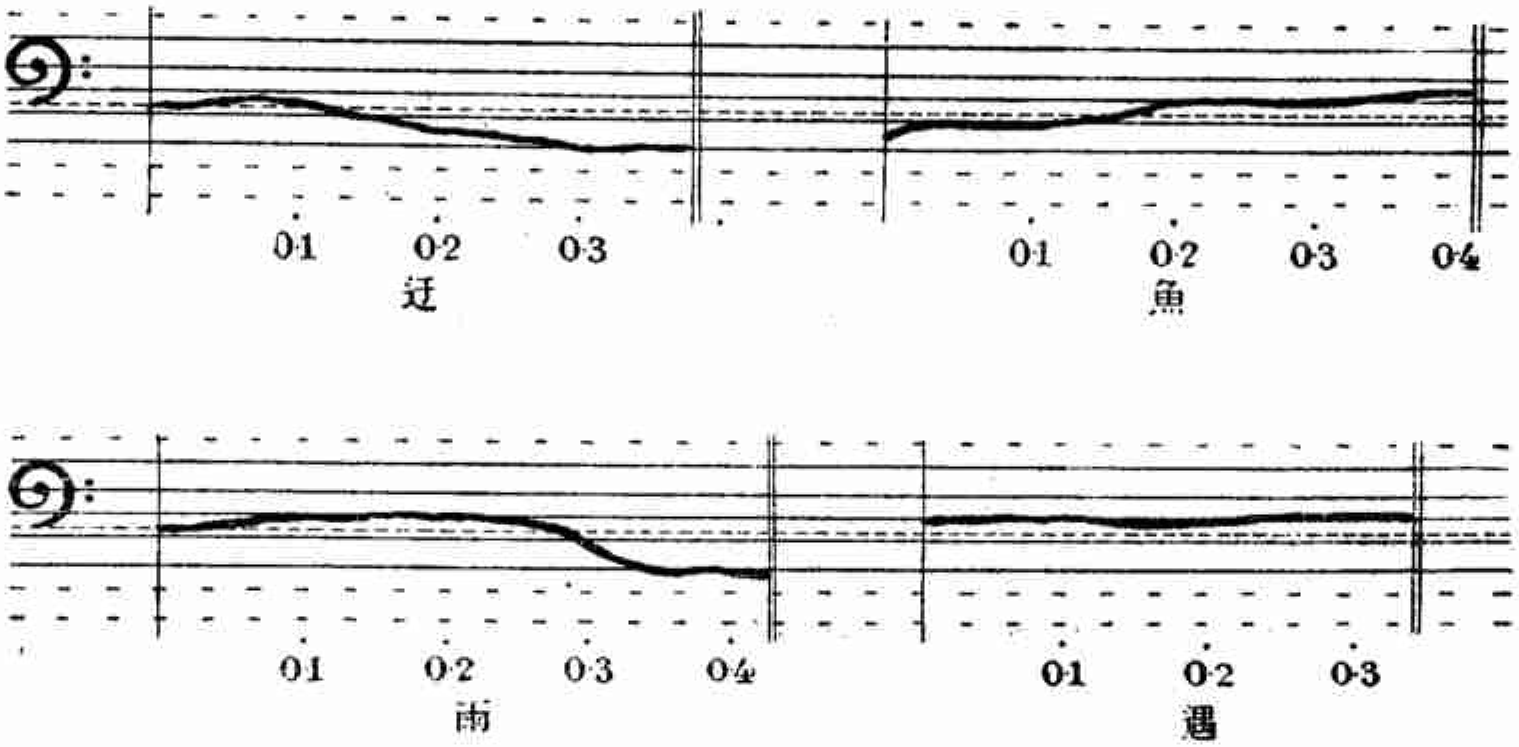
醴 泉 聲 調



烟薰紙速率每秒86*mm*.

陰平	c—d#——B	浪線長22.8*mm*.	時間265 σ
陽平	d ——g	浪線長16.8*mm*.	時間195 σ
上聲	e—a ——e	浪線長19 *mm*.	時間221 σ
去聲	g ——b	浪線長23 *mm*.	時間267 σ

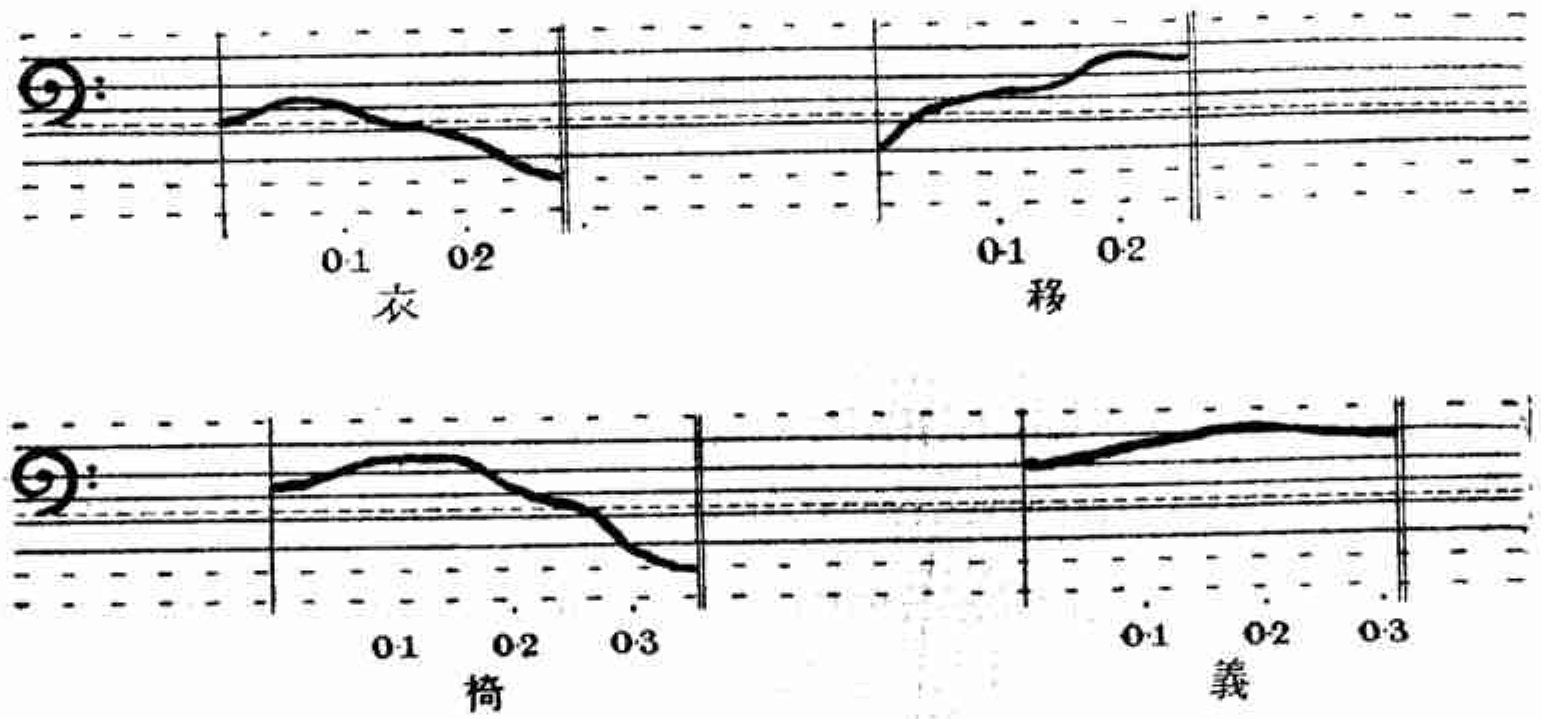
永 壽 聲 調



烟薰紙速率每秒123*mm*.

陰平	c—c# ——G	浪線長46 *mm*.	時間374 σ
陽平	A——e	浪線長49.5*mm*.	時間402 σ
上聲	c—d——G	浪線長51.2*mm*.	時間416 σ
去聲	d——d	浪線長40.8*mm*.	時間332 σ

乾 縣 聲 調



烟薰紙速率每秒99*mm*.

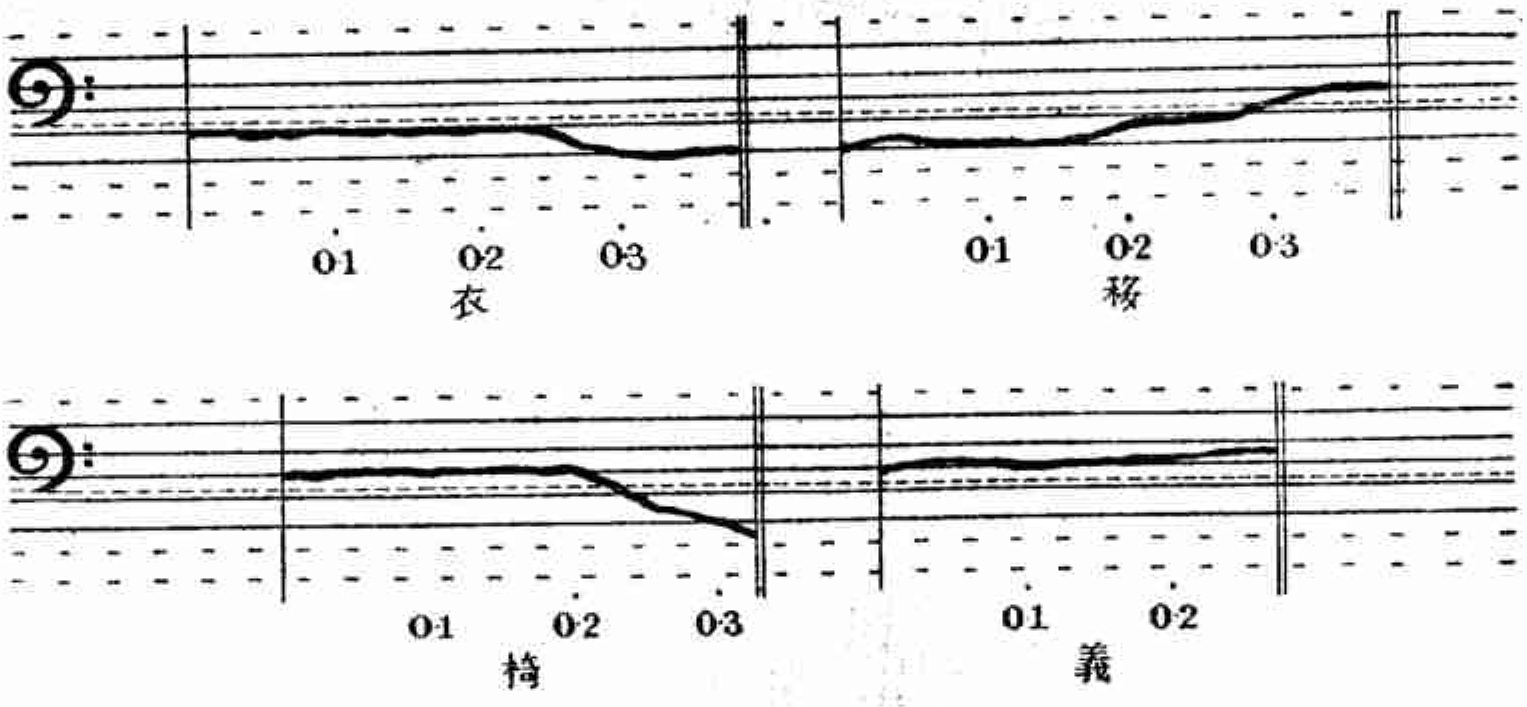
陰平　c—e——E　浪線長28.2*mm*.　時間285 σ

陽平　G——g　浪線長26.1*mm*.　時間264 σ

上聲　e—g——E　浪線長35.8*mm*.　時間362 σ

去聲　f——a　浪線長31.2*mm*.　時間315 σ

同 官 聲 調



烟薰紙速率每秒123*mm*.

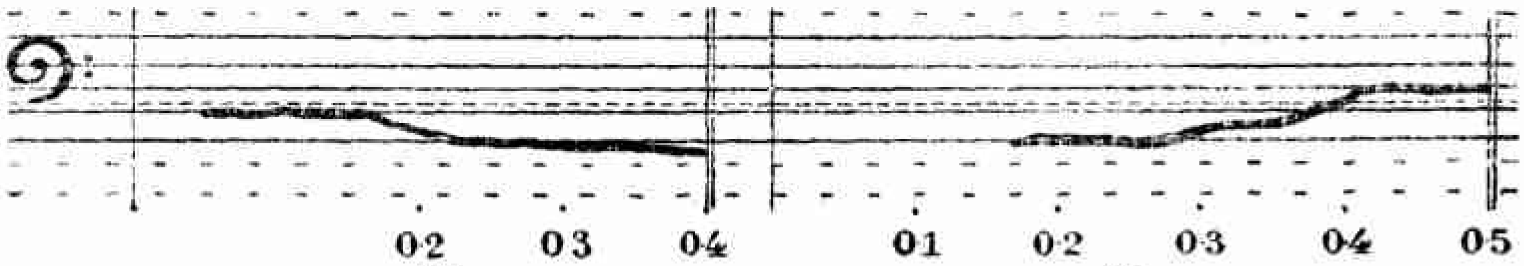
陰平　B——G　浪線長46.2*mm*.　時間376 σ

陽平　G——d　浪線長46　*mm*.　時間374 σ

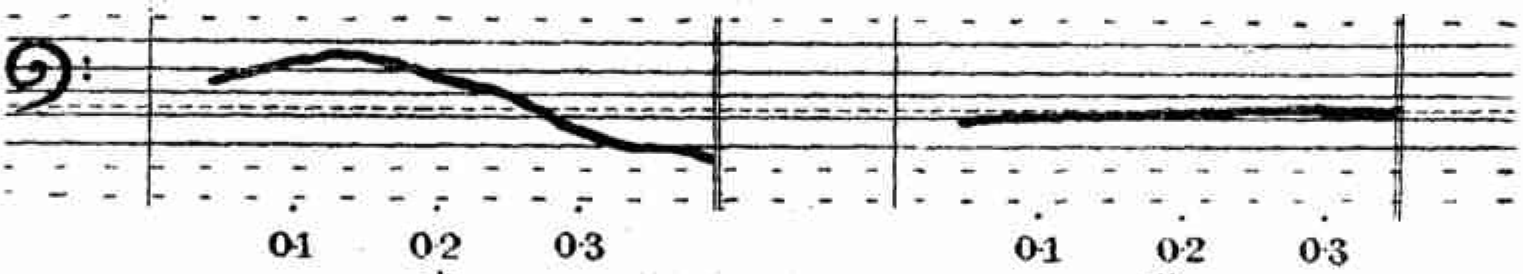
上聲　　d——F　　浪線長40　*mm*.　　時間325 σ

去聲　　d——e　　浪線長33.5*mm*.　　時間273 σ

耀 縣 聲 調



剛　　　　　　陳



古　　　　　　道

烟薰紙速率每秒127*mm*.

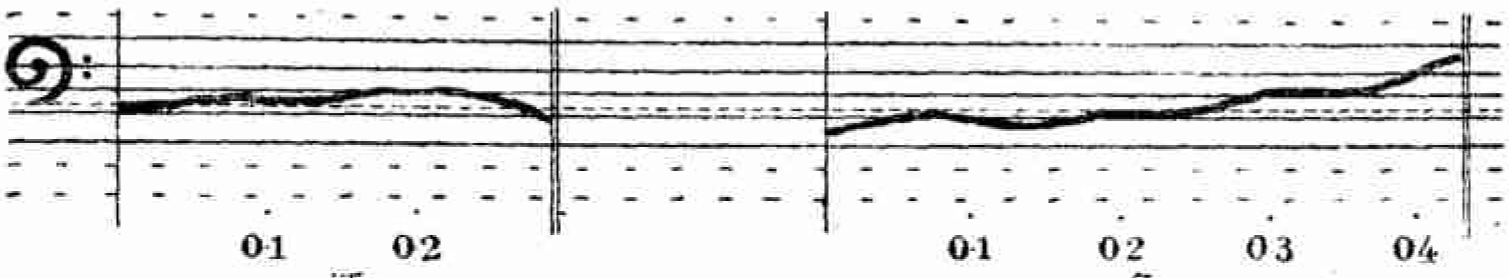
陰平　　B——F　　浪線長48　*mm*.　　時間378 σ

陽平　　G——d　　浪線長60　*mm*.　　時間472 σ

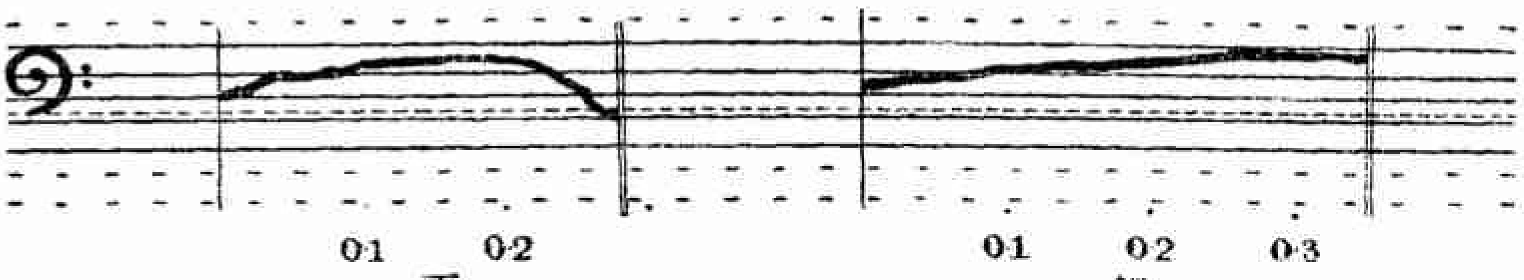
上聲　e—g——F　　浪線長47.2*mm*.　　時間372 σ

去聲　　B——c　　浪線長42　*mm*.　　時間331 σ

淳 化 聲 調



迂　　　　　　魚



雨　　　　　　課

烟薰紙速率每秒126*mm*.

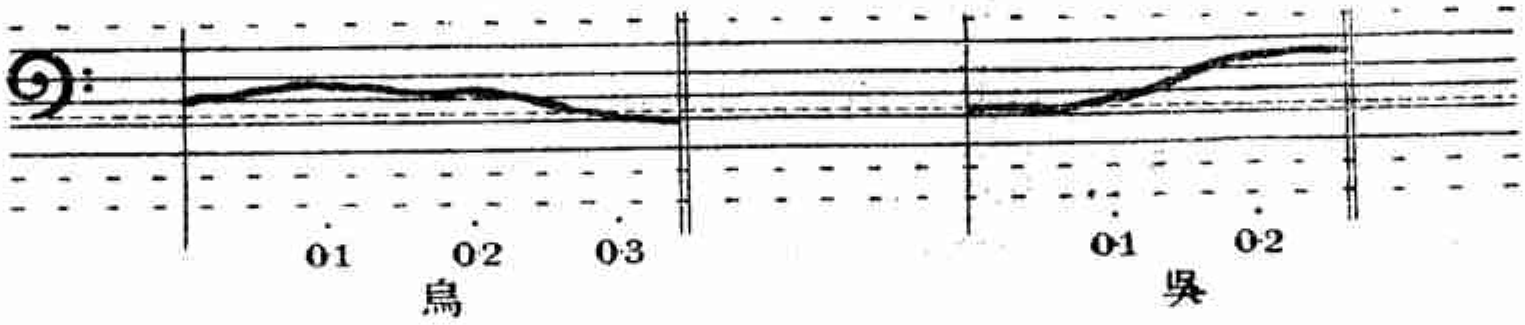
陰平　c—d——B　浪線長36.6*mm*.　時間290 σ

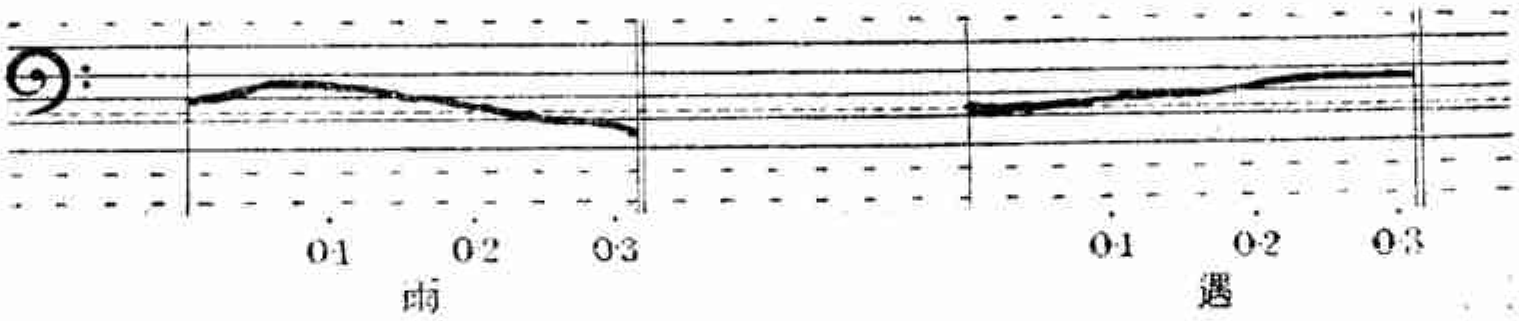
陽平　A——g　浪線長53.9*mm*.　時間428 σ

上聲　d—g——B　浪線長34　*mm*.　時間270 σ

去聲　c——g#　浪線長42　*mm*.　時間333 σ

栒 邑 聲 調





烟薰紙速率每秒120*mm*.

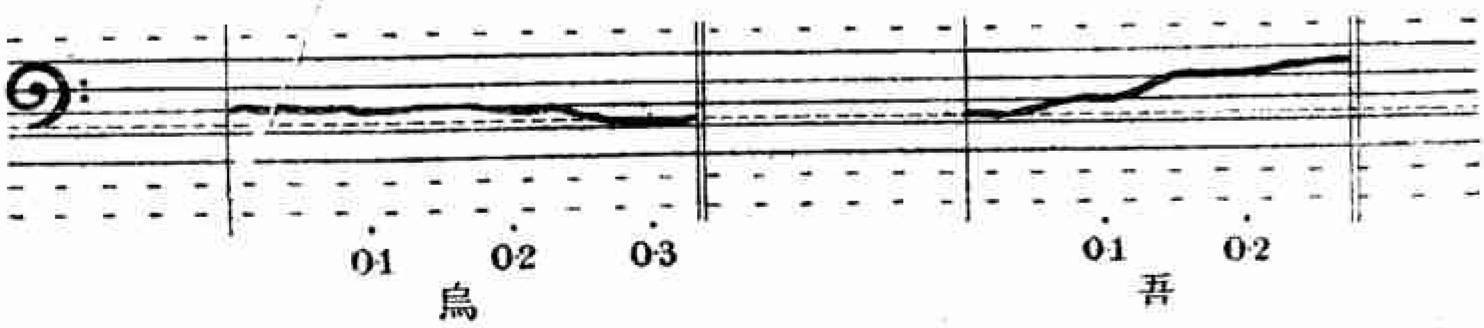
陰平　d—e——B　浪線長42　*mm*.　時間350 σ

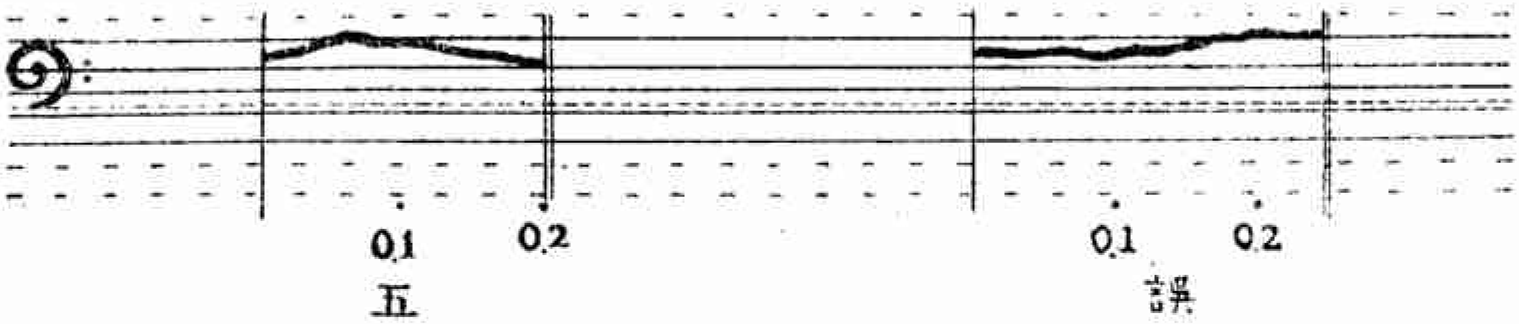
陽平　c——g　浪線長32　*mm*.　時間267 σ

上聲　d—e——A　浪線長38　*mm*.　時間317 σ

去聲　c——e　浪線長37.5*mm*.　時間313 σ

邠 縣 聲 調

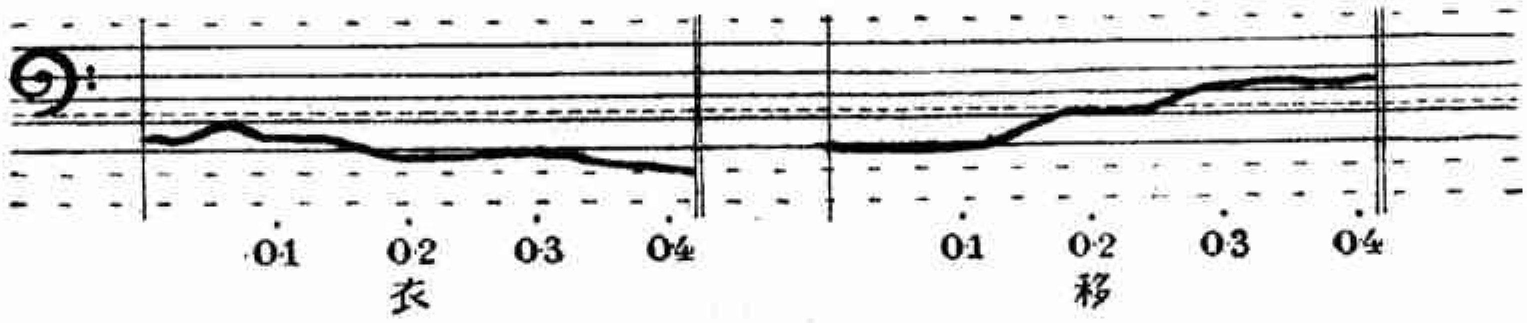


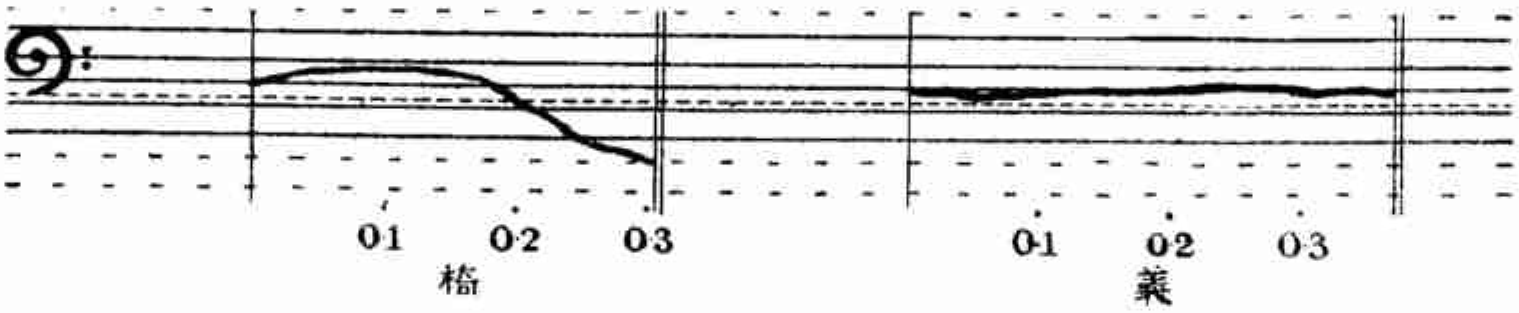


烟薰紙速率每秒120*mm*.

陰平	d——c	浪線長40 *mm*.	時間333 σ
陽平	c——g	浪線長33 *mm*.	時間275 σ
上聲	g—a——f#	浪線長24 *mm*.	時間200 σ
去聲	g——a	浪線長29.5*mm*.	時間246 σ

長 武 聲 調

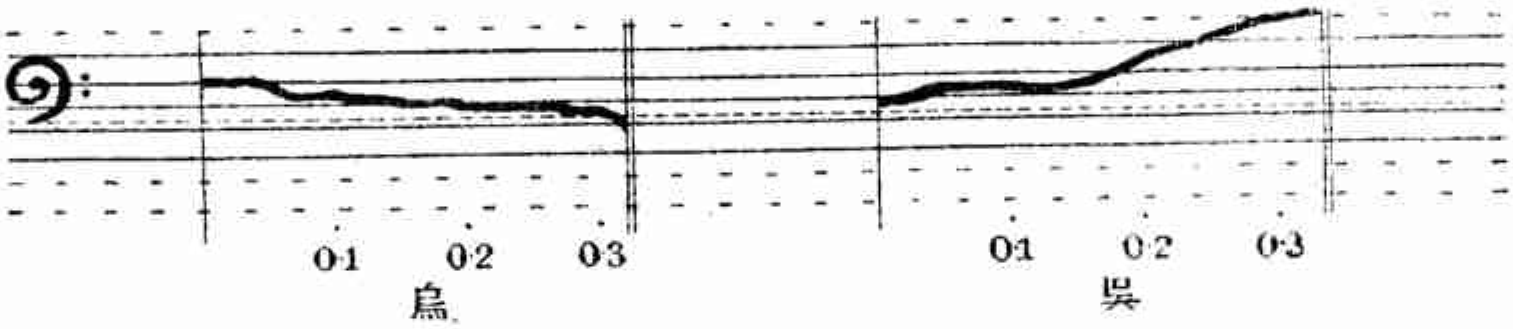


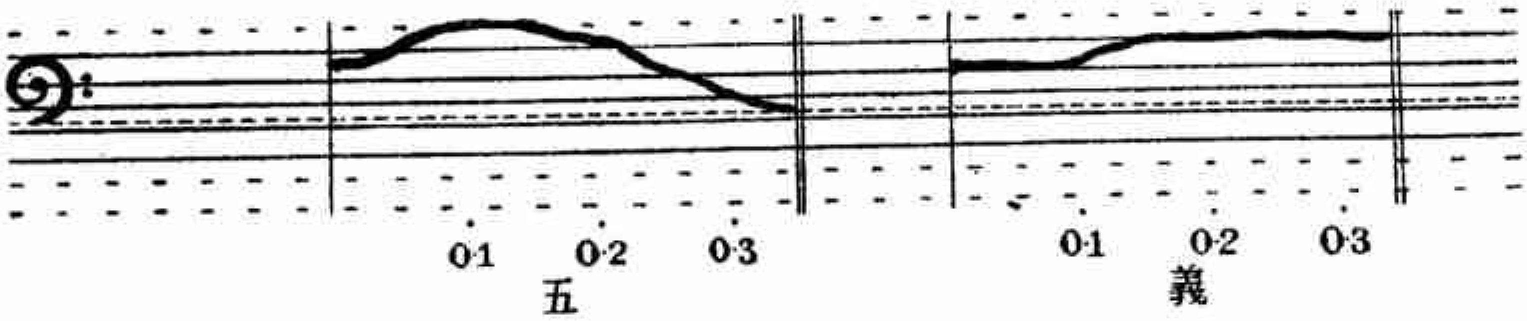


烟薰紙速率每秒118*mm*.

陰平	A—B——E	浪線長46.1*mm*.	時間391 σ
陽平	G——e	浪線長46 *mm*.	時間390 σ
上聲	d—e——E	浪線長34 *mm*.	時間288 σ
去聲	d——d	浪線長40.6*mm*.	時間344 σ

鱗 游 聲 調

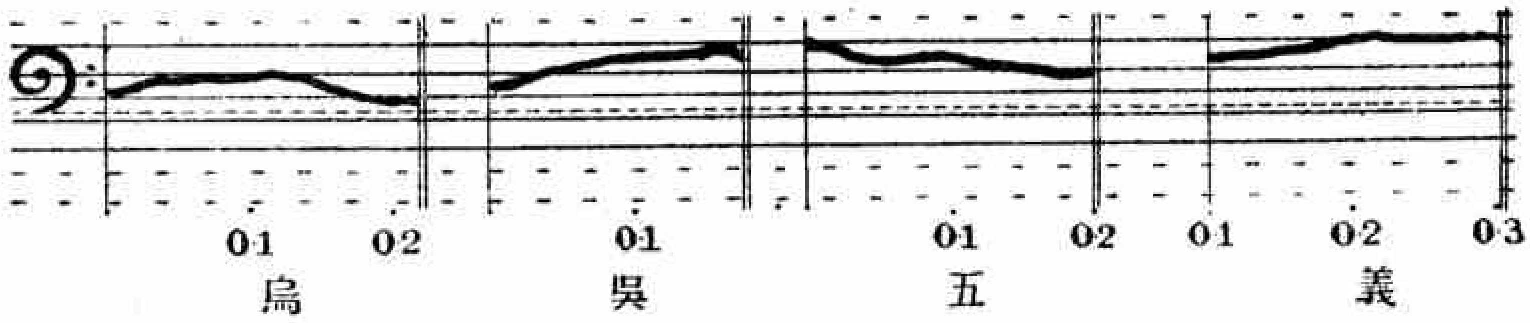




烟薰紙速率每秒113*mm*

陰平	f——B	浪線長35.8*mm*.	時間317 σ
陽平	d——c'	浪線長37·6*mm*.	時間333 σ
上聲	g—c'——c	浪線長38.8*mm*.	時間343 σ
去聲	f# ——a	浪線長37.2*mm*.	時間329 σ

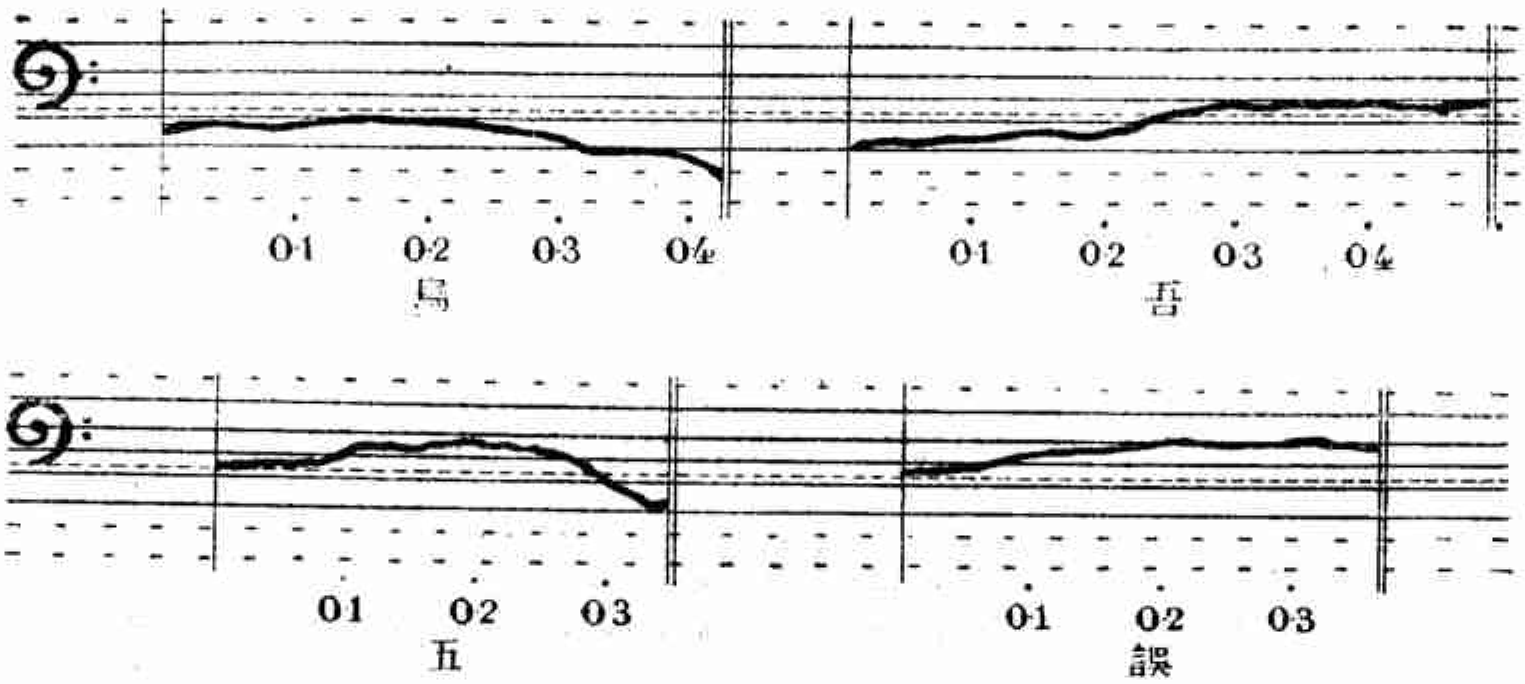
隴 縣 聲 調



烟薰紙速率每秒127*mm*.

陰平	e—f——d	浪線長26 *mm*.	時間205 σ
陽平	e——g#	浪線長21.5*mm*.	時間169 σ
上聲	a——f	浪線長24 *mm*.	時間189 σ
去聲	g——a	浪線長24.5*mm*.	時間193 σ

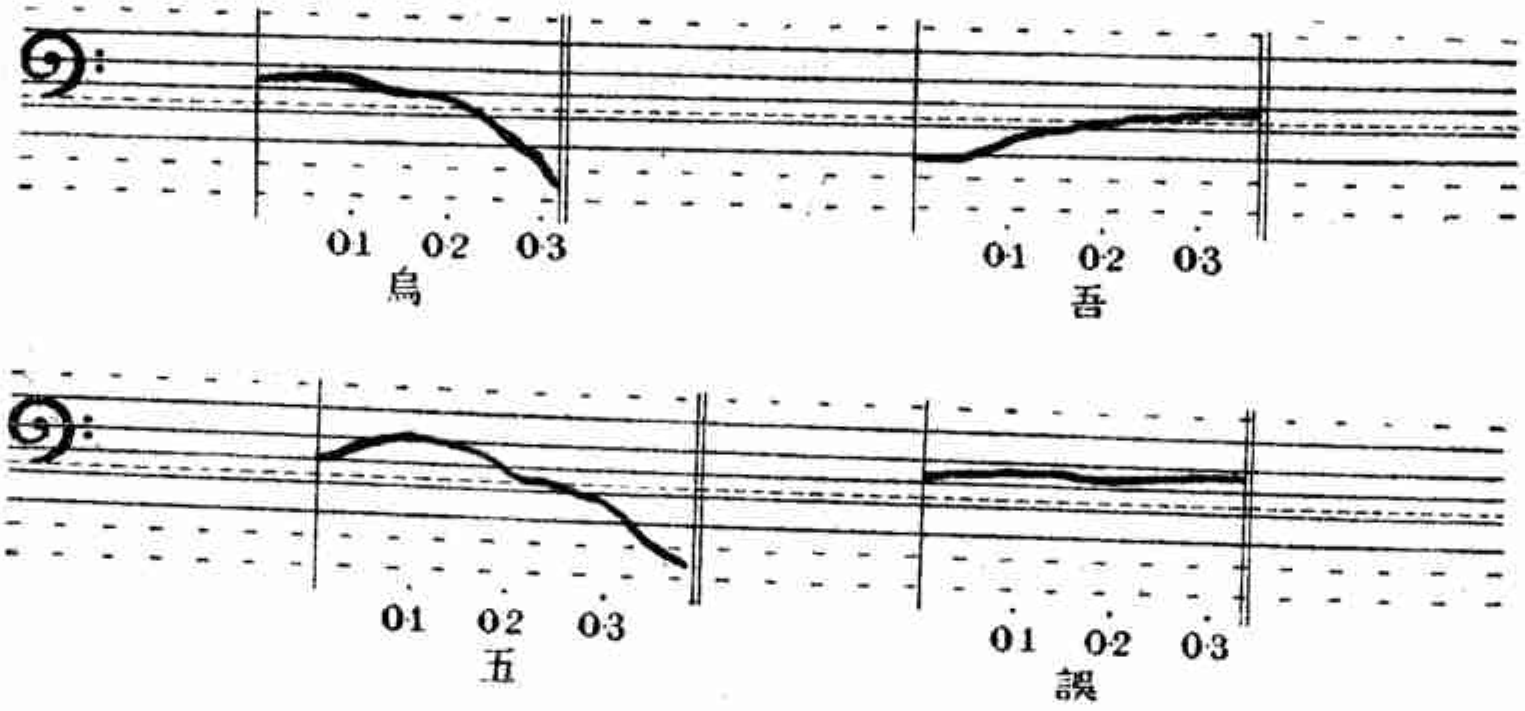
鳳 翔 聲 調



烟薰紙速率每秒118*mm*.

陰平	A—B——E	浪線長46.9*mm*.	時間397 σ
陽平	G——d	浪線長54 *mm*.	時間458 σ
上聲	c—e——A	浪線長38 *mm*.	時間322 σ
去聲	c# ——f	浪線長40 *mm*.	時間339 σ

岐 山 聲 調



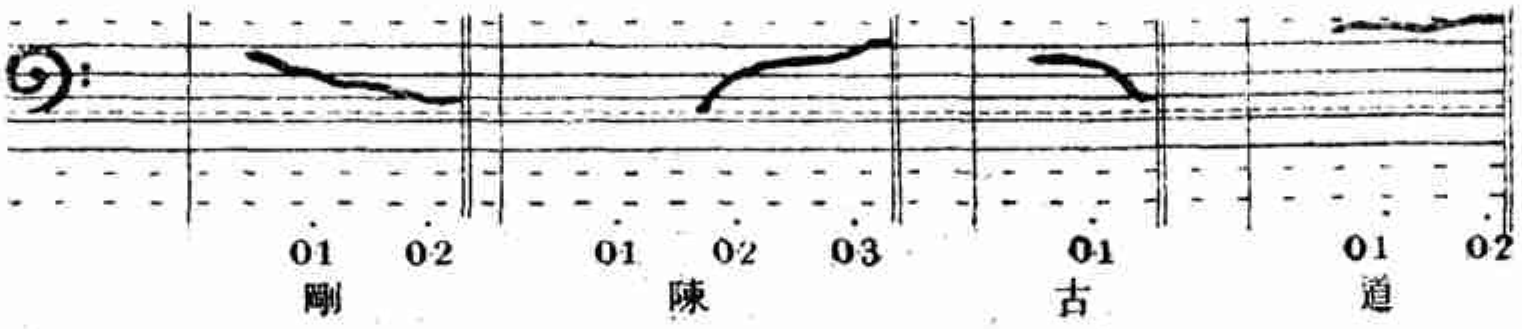
烟薰紙速率每秒84*mm*.

陰平	e——D	浪線長25.8*mm*.	時間307 σ
陽平	G—— c#	浪線長29 *mm*.	時間345 σ

上聲　d--f——D　　浪線長32.2*mm*.　　時間383 σ

去聲　　e——e　　浪線長27　*mm*.　　時間321 σ

扶風聲調



烟薰時速率每秒105*mm*.

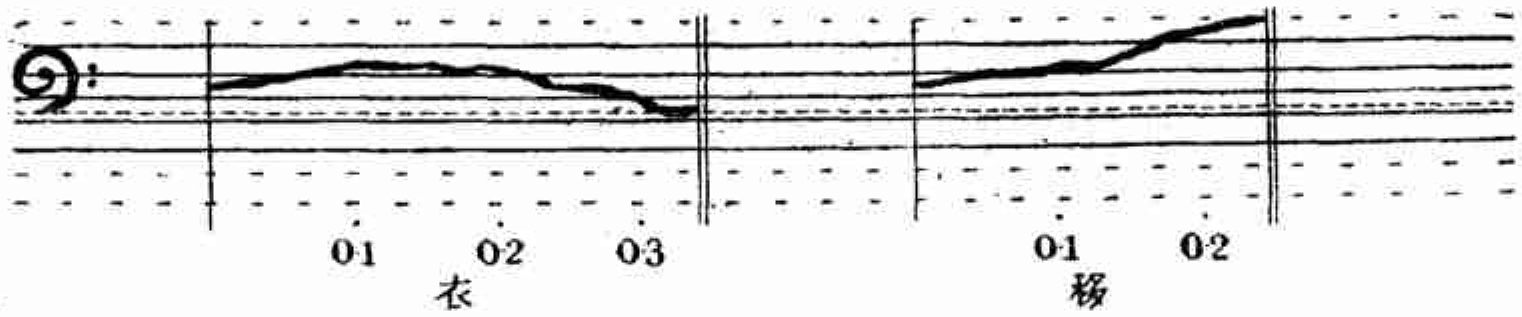
陰平　g# ——d　　浪線長22.5*mm*.　　時間214 σ

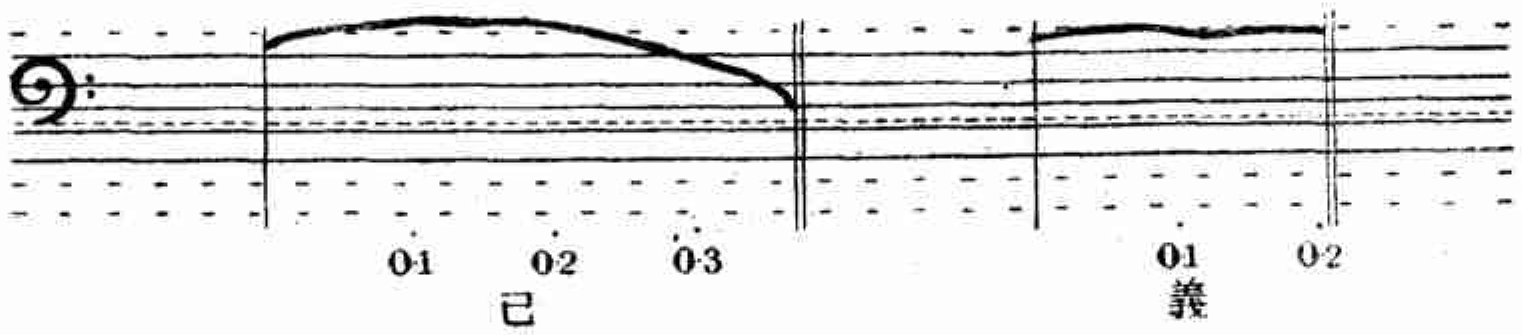
陽平　　c——a#　　浪線長33　*mm*.　　時間314 σ

上聲　　g——d　　浪線長15.5*mm*.　　時間148 σ

去聲　　b——c'　　浪線長21.5*mm*.　　時間205 σ

郿縣聲調





烟薰紙速率每秒120*mm*.

陰平　e—f# ——c　　浪線長41　*mm*.　　時間342 σ

陽平　　e——c'　　浪線長30　*mm*.　　時間250 σ

上聲　b—d'——d　浪線長44.5*mm*.　時間371 σ

去聲　c'——c'　浪線長25 *mm*.　時間208 σ

據實測這三十九縣聲調曲線所得的結果來分析研究，我們可以知道下述八事：

子・關於調勢曲折的：

a.陰平先升後降，升度小，降度大，甚至於祇降不升。

升度最小的祇有兩個半音(如富永隴商)，最大的也不過五個半音(如三乾韓)，平均約三個半音强。因升勢不大，所以有時可以不升。據此次調查所得，祇降不升的有白咸岐邠臨維陰朝西藍盩同蒲扶麟潼耀十七縣。至於降度，則至小有三個半音（如邠縣），最大達十五個半音（如岐山），平均約七個半音弱，比升度要大一倍了。

b.陽平由低升高，升度頗大。

升度最小的有五個半音（如涇華盩隴），最大的達十三個半音（如乾縣），平均約八個半音强。

c.上聲先升後降，升度小，降度大，有如陰平；但升降度均較顯著，是與陰平不同處。

升度最小的有兩個半音（如高陵），最大的達八個半音（如澄城），平均約四個半音强。因升勢較小，也可省略，但不如陰平之易。此次調查，祇降不升的得隴商同富盩興陰扶八縣。然而也有升降兩度平衡，起終兩點水平，成一穹窿形的（如大渭澄）。降度最小的有三個半音（如大荔），最大的達十六個半音（如乾岐），平均約九個半音弱。

d.去聲高平而略升。

升度最小的有兩個半音(如扶蒲耀澄雒)，最大的也不過七個半音(如三原)，平均約四個半音弱。此外讀作全平不升不降的有白華岐長商大永鄜陰九縣。

丑・關於聲調高低的：

e.陰平最低

起點最低的在 F（如鄠涇），最高的在 f（如華興），平均略高於 c#。

頂點最低的在 G（如蒲城），最高的在 a（如盩厔），平均略高於 d。

終點最低的在 D（如涇岐）， 最高的在d（如潼扶隴盩）， 平均略高於G# 。

f.陽平自低升高

起點最低的在 E（如白蒲）， 最高的在 g（如盩厔）， 平均略低於B 。

終點最低的在 B（如鄠蒲涇白），最高的在 c'（如咸郿麟），平均略低於 f# 。

g.上聲自高而降

起點最低的在 G（如澄蒲鄠）， 最高的在 b（如藍郿），平均略低於 e。

頂點最低的在 B（如鄠縣），最高的在 d'（如藍郿），平均略高於f# 。

終點最低的在 C（如鄠縣），最高的在 f#（如邠縣），平均略低於 B。

h.去聲最高

起點最低的在 E（如蒲城），最高的在 c'#（如富平），平均略低於 e。

終點最低的在 F（如蒲城），最高的在 e'（如富平），平均略高於 f# 。

試就所得結果再作綜合比較研究，我們又可以知道下列四事：

寅・關於聲調高低的：

i. 四調高低之較，陰平最低，陽平較高，去聲又較高，上聲最高。

ㄅ.陰平與陽平比較：

先用陰平頂點與陽平終點（卽頂點）比：

陰高於陽的：隂岐兩縣；

陰同於陽的：興渭兩縣；

陰低於陽的：其餘三十五縣。

（隂岐兩縣陰平都是只降不升，不似他縣先升後降。）

可知陰平頂點，以低於陽平終點爲正則。

再用陰平終點（卽低點）與陽平起點（卽低點）比：

陰高於陽的：白淳臨渭隂五縣；

陰同於陽的：邠三澄興同五縣；

陰低於陽的：其餘二十九縣。

可知陰平終點，以低於陽平起點爲正則。

ㄆ.陰平與上聲比較：

先用陰平頂點與上聲頂點比：

陰高於上的：扶維兩縣；

陰同於上的：興栒兩縣；

陰低於上的：其餘三十五縣。

可知陰平頂點以低於上聲頂點爲正則。

再用陰平起點與上聲起點比（起點卽頂點者不計）：

陰高於上的：澄渭兩縣；

陰同於上的：栒永兩縣；

陰低於上的：其餘十四縣。

可知陰平起點以低於上聲起點爲正則。

（栒永陰平與上聲逼肖，起點同，頂點差半音，故終點相同。 澄渭上聲起點與終點平，起點至頂點的彎曲大，故起點低於陰平。）

再用陰平終點（卽低點）與上聲終點（卽低點）比：

陰高於上的：陰栒潼鄠同五縣；

陰同於上的：興渭澄耀扶永淳長岐乾富蒲十二縣；

陰低於上的：其餘二十二縣。

可知陰平終點，以低於上聲終點爲正則。

一.陰平與去聲比較：

用陰平頂點與去聲終點（卽頂點）比：

陰高於去的：陰蒲兩縣；

陰同於去的：岐栒澄渭興五縣；

陰低於去的：其餘三十二縣。

可知陰平頂點以低於去聲終點爲正則。

故知陰平最低。

二.陽平與上聲比較：

先用陽平起點（卽低點）與上聲終點（卽低點）比：

陽高於上的：鄠乾華咸長岐耀潼麟永維栒同富蒲盩郿十七縣；

陽同於上的：涇高商興澄朝六縣；

陽低於上的：醴韓白淳鳳邠郃大隴扶陰渭臨三藍西十六縣。

可知陽平起點與上聲終點，高低互有出入。但應注意的，高低點分數目幾乎相等，因此不妨斷定，陽平起點與上聲終點，以相平為正則。

再用陽平終點（卽頂點）與上聲頂點比：

陽高於上的：高商扶永雒栒六縣；

陽同於上的：鄠乾華淳長麟興同富盩十縣；

陽低於上的：醴涇韓咸白鳳邠郃岐大隴耀潼陰渭澄臨三蒲郿藍西朝二十三縣。

可知陽平終點，以低於上聲頂點為正則。

万.陽平與去聲比較：

用陽平終點（卽頂點）與去聲終點（卽頂點）比較[1]

陽高於去的：長商高耀麟永雒澄栒蒲十縣；

陽同於去的：華韓郃潼興陰渭郿八縣；

陽低於去的：醴鄠乾涇咸白淳鳳邠岐大隴扶臨三同富盩藍西朝二十一縣。

可知陽平終點以低於去聲終點為正則。

據上ㄇ項已知陽平高於陰平。

故知陽平高於陰平，低於去聲，與上聲低點相若而頂點略低。

ㄉ.去聲與上聲比較：

先用去聲起點（卽低點）與上聲頂點比：

去高於上的：扶富二縣；

去同於上的：華商永同四縣；

去低於上的：其餘三十三縣。

可知去聲起點以低於上聲頂點為正則。

再用去聲終點（卽頂點）與上聲頂點比：

(1) 陽平起點與去聲起點高低之較，僅蒲城一縣去聲低於陽平，栒雒兩縣，同於陽平，此外各縣，高低相差甚鉅，故不列入比較。

去高於上的：醴鄠乾淳鳳扶同富盩西十縣；

去同於上的：華涇咸邠商隴永興雒栒三臨十二縣；

去低於上的：朝白長高部岐大耀滴麟陰澄蒲鄠藍朝渭十七縣。

可知去聲終點亦以低於上聲頂點者爲多。

據上文一方二項已知去聲高於陰陽平。

故知去聲佔第三位。

據上文已知陰平陽平去聲均較上聲爲低。

故知上聲最高。

j. 四調特牲，陰平以低平顯，陽平以揚起顯，上聲以降落顯，去聲以高平顯。

據上文 i 項證明，固然可以說四調比較起來陰平最低，上聲最高，陽去居中。但各調的特色並不以這個作標準。 就各調的特色來說，實在是陰平低平，去聲高平，陽上以揚起與降落爲主，高低不關重要。 陰平以低平爲主，他在起始時的上升不過是爲讀得顯著一點，所以升度不大（最大的不過五個"半音"，平均兩個"半音"弱），或簡直不升（如白咸岐滴等十七縣）。 至於終點下落也不過是抑之使平的關係；本來是抑之使平，又加以音尾弛緩，於是要下降幾度了。 陽平以上揚爲主，所以他的起點可以比陰平終點低（如白淳滴渭陰），可以比陰平終點高（如長鳳部等縣），也可以和陰平終點平（如邠三澄等縣），甚至於比上聲起點還高，和上聲頂點只差"半音"（如雒南）。 至於他的頂點，雖以低於上去的頂點爲正則，然而高於上聲的也有六縣，高於去聲的更有十縣，可見他的高低不是區別的重要條件了。 上聲以降落爲主，緊要處在自高而降；惟其要自高而降，所以先要上升。 有時只注意到頂點的顯著，忽略了下落的延長，於是有渭澄醴等縣起迄相平成一穹窿形的現像。 有時開口便高到不必再升，於是就可以不升，逕直下降（如白同富等縣）。 他和陽平一樣，不以高低爲其區別的主要條件，所以可以高到爲四調之冠（如耀大藍鄠等縣），也可以低於陽平的終點（如扶永高商等六縣）。 去聲以高平爲主，他的特色端在平而高。 惟其平，所以他可以低到和陽平起點平（如蒲城[1]）；惟其高，所以可以單獨比其他三調高出九個"半音"（如富平）。 他的稍升也是爲維

持高平的關係，所以有時也可以不升（如鄜白商等九縣）。

卯・關於時間長短的：

k.四調長短之較，平均陽平最長，陰平次之，上去均較短。

試將各縣聲調時値，列爲一表，並分別平均之。

聲調 時値 縣名	陰 平	聲調 時値 縣名	陽 平	聲調 時値 縣名	上 聲	聲調 時値 縣名	去 聲
三	592	渭	585	盩	451	渭	544
韓	557	白	553	三	441	郃	500
渭	472	臨	535	臨	437	韓	446
興	459	興	501	興	420	蒲	417
蒲	447	商	482	永	416	維	402
鄠	416	耀	472	白	393	澄	400
藍	400	三	470	岐	383	大	391
鳳	397	維	468	渭	374	白	389
涇	395	鳳	458	耀	372	興	348
臨	394	淳	428	鄜	371	長	344
長	391	大	427	韓	367	商	340
朝	382	郃	422	乾	362	鳳	339
維	381	高	410	鄠	362	華	333
盩	378	永	402	蒲	359	淳	333
耀	378	蒲	399	麟	348	永	332
同	376	長	390	郃	339	耀	331
永	374	韓	388	商	33[illegible]	富	331
高	368	同	374	富	328	麟	329
大	367	朝	369	同	325	高	322
郃	361	陰	369	鳳	322	岐	321
栒	350	澄	345	澄	321	乾	315
商	344	岐	345	栒	317	鄠	313
鄜	342	涇	337	潼	316	栒	313
邠	333	麟	333	維	312	豫	308

（1）這是個極端的例，發音人只顧到平，忘了高，所以說得這樣低，實際上不會低到如此的。 又因這是陰陽上去對比着說的，所以還能分辨，倘使單說，便不容易和陰平區別了。

盩	317	鄠	328	高	299	朝	293
岐	307	扶	314	華	296	臨	289
涇	306	盩	275	陰	292	藍	279
白	305	邠	275	長	288	同	273
華	303	栒	267	朝	275	醴	267
淳	290	乾	264	淳	270	三	266
乾	285	澄	253	藍	247	咸	260
咸	279	鄜	250	涇	244	郃	246
醴	265	華	233	咸	242	陰	228
澄	264	宮	231	醴	221	潼	224
陰	253	咸	216	邠	200	鄜	208
宮	215	藍	214	大	191	扶	205
扶	214	醴	195	隴	189	涇	198
隴	205	西	188	西	161	隴	193
西	152	隴	169	扶	148	西	143
共	13614	共	13934	共	12330	共	12313
平均	349	平均	357	平均	316	平均	316

據表上平均數可知陽最長，陰次之，上去均較短。　但相差亦不遠。

1.區別四調，時間長短不關重要

就下項觀之，四調的時間長短，似乎也有一點區別；然而實不關重要。　試先就四調的總長而論，最長如渭南，達 1975σ，幾長兩秒；而最短如長安，不過 644σ ，　僅半秒稍強而已。　然而陰陽上去，一樣分得很清楚的。　若再就各縣四調本身作比，則如渭南陰陽及去均長(陽去均占第一位陰占第三位)而上聲獨短(占第八位)，相差約三分之一；又如三原陰陽上均長（陰占第一位上占第二位）而去聲獨短(占第三十位)，相差在一倍以上。　若再就每縣四調一一比較，卽可知甲縣陽平忽短，乙縣陰平忽長，丙縣四調相若。　總之，都可以證明，區別陰陽上去四調，時間長短不關重要。　劉先生談研究四聲的心得時亦云："我們耳朶裏所聽見的各聲的區別，只是高低起落間的區別；實際上長短雖然也有些區別，却不能算作區別"[1]。

最後，因劉先生曾說："聲音的高低，男，女，老，少，各自不同"[2]。 又說："高低起落間的比例，也並不是絕對不變的"[3]。 所以還應當附帶報告的有兩事：

m. 在聲音高低上，這三十九人中，聲音最低的當屬鄠縣與蒲城。 鄠縣最低到 C（上聲之終點），最高纔到 c（去聲之終點）。 蒲城最低到 D（平上之終點），最高也不過到 c（上聲之高點）。 最高的當屬富平與盩厔。 富平最高到 e'（去聲之終點），最低到 G（陰上之終點）。 盩厔最高到 d'（去聲之終點），最低纔到 d（陰平之終點）。 此外藍田郿縣最高到 d'（上聲之高點），最低到 A#（藍陰平之終點）或 c（郿陰平之終點），都不能算很低。 其間高低之差，約一協(octave)有餘。

n. 在起落大小上，這三十九人中，最大的當屬乾縣與岐山。 乾縣陽平起點到終點有十三個半音，岐山陰平起點到終點有十五個半音，均在三十九縣中占第一位。 而上聲起落距離同有十六個半音之多，尤為各縣之冠。 至於距離最小的，要算醴泉與郃陽。 醴泉距離最大的不過六個半音（陽平之起落），而郃陽最大不過七個半音（上聲之頂點至終點）。 兩兩比較，相差有十個半音了。

（四）

據上述可知關中各縣聲調，升降方向，完全相同；其間稍有出入的地方，並不足以變更牠們的共同性。 劉先生說得好：

"儘可以同是某一處的某一聲，只須換兩個人說，試驗的結果就不能完全相同。 不但兩個人，便是同一個人說兩次，也不免大同小異。 他的大同，是此聲與彼聲間的根本區別，我們稱他為聲的共同性；他的小異，是同一聲中自有的紛歧，我們稱他為聲的個性。 因此我們無論試驗那一聲，結果只是某一人在某一時所發的某一聲："某一聲"的公同性，當然包藏在結果之內；而"某一人"和"某一時"上所有的個性，也同時附屬在內[4]。"

又說：

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(1) 四聲實驗錄第51節

(2)(3)(4) 同上第52節

"這高低起落間的比例，也並不是絕對不變的。 通常是性質活潑的人，或者是一個人在精神興奮的時候，他語音的高低起落，就很利害，結果是最高點與最低點相距極遠；反之，性質和緩的人，或者是一個人在精神疲倦的時候，他語音的高低起落，也就跟着和緩，結果是最高最低兩點，相距極近[1]。

有這兩段解釋，我們應當承認，上述實驗所得三十九縣中升降起落的種種差別，至少一部分是因"個人"或"一時"的差異，是一種聲的個性。 如有方言的差別大概絕不止僅差這麼些。 因此我們不妨把這三十九縣所得的四調結果分別平均，就可以得出關中的平均代表聲調。 平均的方法是這樣：

劉先生說：

"為比較或統計高低的方便起見，我們可以把 A. J.Ellis 的'循環百分數'(Cyclic cents)省去兩個 o, 而稱之為'語音學中的音高度' (Phonetic pitch degree)，並定 c 的度數為 12，c# 為 13，d 為 14，由此向上推至 b 為 23，c' 為 24；B為 11，A# 為 10，A 為 9，由此向下推至 D 為 1，C 為 o[2]"

根據這個方法，先假定：

C = 0	G = 7	d =14	a =21
C# = 1	G# = 8	d# =15	a # =22
D = 2	A = 9	e =16	b =23
D# = 3	A# =10	f =17	c' =24
E = 4	B =11	f# =18	c'# =25
F = 5	c =12	g =19	d' =26
F# = 6	c# =13	g# =20	d'# =27
			e' =28

(1) 四聲實驗錄第52節

(2) 參閱乙二聲調推斷尺一文注11。

然後將各縣調值代入，列為一表，並平均之：

縣名＼高低調值＼聲調	陰平			陽平		上聲			去聲	
	起點	頂點	終點	起點	終點	起點	頂點	終點	起點	終點
白		9	5	4	11	12	14	7	12	12
咸		19	11	17	24	19	23	14	21	23
韓	10	14	7	9	19	19	21	16	16	19
涇	5	7	2	7	11	11	14	7	12	14
華	17	19	10	17	21	18	21	15	21	21
乾	12	16	4	7	19	16	19	4	17	21
鄠	5	8	2	5	11	7	11	0	9	12
醴	12	15	11	14	19	16	21	16	20	23
岐		16	2	7	13	14	17	2	16	16
郃	16	17	12	16	21	20	23	17	17	21
高	13	15	10	13	19	16	17	13	14	16
邠		14	12	12	19	19	21	18	19	21
鳳	9	11	4	7	14	12	16	9	13	17
長	9	11	4	7	16	14	16	4	14	14
淳	12	14	11	9	19	14	19	11	16	20
三	7	11	5	5	16	14	17	11	11	17
臨		14	11	9	19	16	21	14	17	21
栒	14	16	11	12	19	14	16	9	12	16
澄	9	12	7	7	13	7	14	7	11	12
渭	12	14	11	7	14	11	15	11	12	14
雒		18	11	16	21	14	17	12	16	17
陰		16	11	9	15		17	10	15	15
興	17	19	12	12	19		19	12	17	19
朝		12	7	9	16	16	19	9	12	17
西		16	12	15	20	19	21	17	19	23
藍		16	10	14	21	23	26	16	21	24
郿	16	18	12	16	24	23	26	14	24	24
盩		21	14	19	23		23	17	24	26

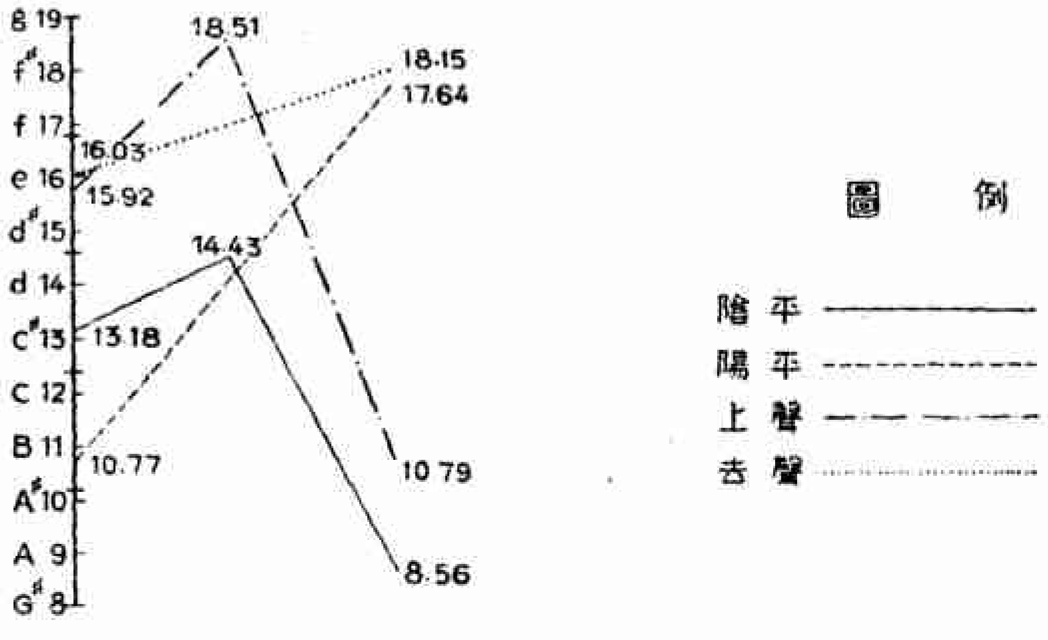
蒲		7	2	4	11	7	12	2	4	5
窩	16	17	7	14	19		19	7	25	28
同		11	7	7	14		14	5	14	16
永	12	13	7	9	16	12	14	7	14	14
扶		20	14	12	22		19	14	23	24
麟		17	11	14	24	19	24	12	18	21
潼		18	14	15	21	19	22	11	18	21
櫟		11	5	7	14	16	19	5	11	12
隴	16	17	14	16	20		21	17	19	21
大	9	12	5	9	14	17	19	17	16	16
商	11	12	7	12	17		15	12	15	15
總　計	514	563	334	420	688	621	722	421	625	708
平　均	13.18	14.43	8.56	10.77	17.64	15.92	18.51	10.79	16.03	18.15

附註：陰平與上聲，均有數條頂點卽起點者，以頂點代起點計算。

據表末平均結果，可得關中標準聲調的調值如下：

陰　平	陽　平	上　聲	去　聲
c# —d—A (+ + −)	B——f# (− −)	e—g—B (− − −)	e——f# (+ +)

這四調中，最高的是 g，最低的是A，其間共有十一個"半音"。 若分為五段，則每段等於2.2"半音"。 試爲繪一圖：



因得寬式的聲調符號(Tone letter)如次：

陰平	陽平	上聲	去聲
˧˦˩	˨˥	˦˥˨	˦˥
341:	25:	452:	45:

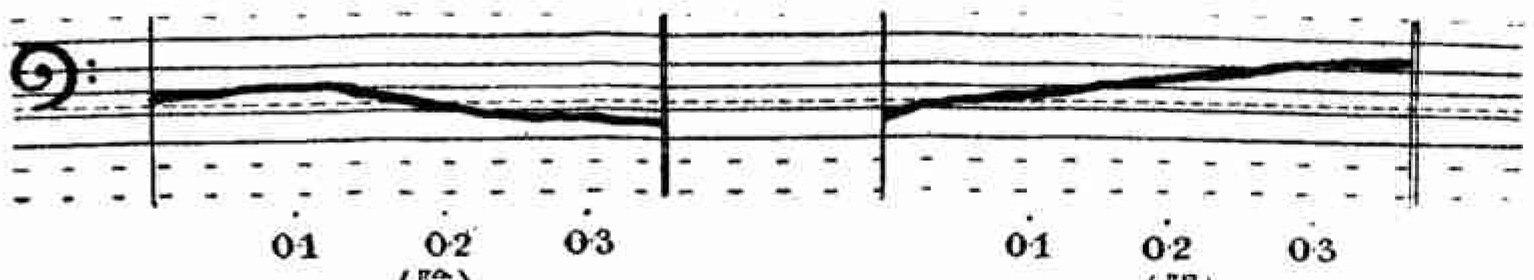
若再將三十九縣聲調的時間平均，又可得一標準時值。試計算之：

	最長(例縣)	最短(例縣)	三十九縣平均
陰平	592 σ (三原)	152 σ (長安)	349 σ
陽平	585 σ (渭南)	169 σ (隴縣)	357 σ
上聲	451 σ (盩厔)	148 σ (扶風)	316 σ
去聲	544 σ (渭南)	143 σ (長安)	316 σ

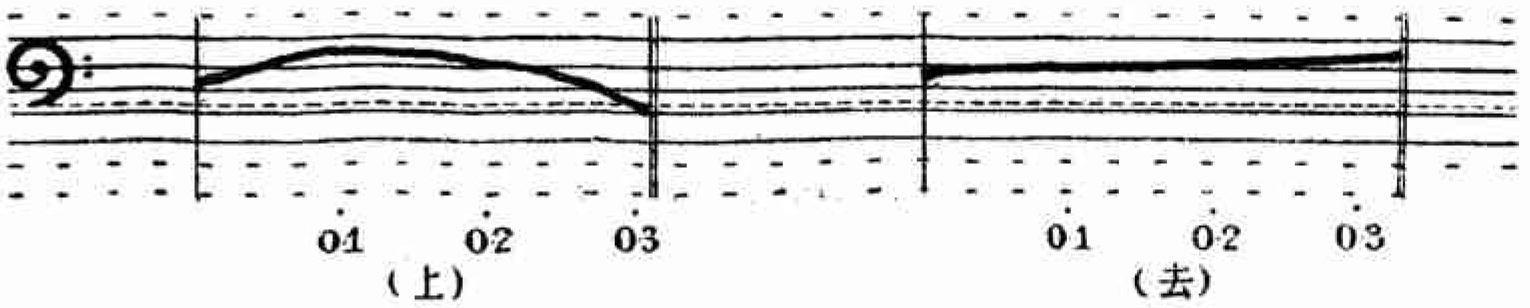
設假定烟薰紙上浪紋振動數爲每秒 120，試用上述標準時值計算其浪紋長度，則爲：

陰平	$349\times\frac{120}{1000}=41.88$	卽 42 mm.
陽平	$357\times\frac{120}{1000}=42.84$	卽 43 mm.
上聲	$316\times\frac{120}{1000}=37.92$	卽 38 mm.
去聲	$316\times\frac{120}{1000}=37.92$	卽 38 mm.

因可繪一理想的標準聲調曲線圖如下：



(陰)　　　　(陽)



(上)　　　　(去)

這可以叫作理想的"縣際"聲調，就是關中三十九縣的人士辨起聲調來，都和這曲線相

差不遠，同時也都有些微小的差異，不能絕對符合。 用牠作標準來模擬關中的聲調，可以得其彷彿了。

民國二十三年四月，在北平。

劉半農先生

（1891—1934）

劉半農這個人名，我起初只認爲是新詩人當中對於音調上寫得特別流利的一個作家。　在民國十年，我正在注意中國單字聲調的實驗法，——那時我只見過加利佛尼亞的勃辣累和瑞典的高本漢每人曾經做過很不完全的對於北京四聲的一次的實驗，——忽然聽見有大規模的四聲實驗錄出世，於是才知道風趣文人的劉半農，也是賣氣力硬幹的語音實驗家的劉復。　十年前到了巴黎，打聽到了劉半農家是住在拉丁區裏rue de l' Estrapade 的一個小房子裏。　房子已經夠小了，可是桌椅板凳鍋灶碗盞之間，發現東一個音鼓，西一個留聲機，留聲機可是不是專爲唱留聲片用的，乃是爲轉動音浪計用的。　那時他的更大規模的漢語字聲調實驗錄論文的實驗工作已經快做完了，所用的方法，還是量浪算對數的舊法子。　可是他又拿着『前人栽樹，後人乘涼』的精神，先後發明了直接量對數的音高推斷尺（Liugraph）跟乙二聲調推斷尺。　我還記得有一天他同造Lioretgraph的人談起 Liugraph來，因爲兩個字音相近，談了半天，那個人說，『我以爲說的是我的-graph呐，原來說的是你的-graph 阿』。　誰知道過了不多年『你的-graph』畢竟給我們語音學的後死的人去"乘涼"去了！

半農和我是一個多方面的小同行。　我們都搞敲敲釘釘拉拉吹吹的頑意兒。　他在民十四年發起了數人會，我們和錢玄同，黎劭西，汪一庵，林語堂六個人每星期聚會談論國際音標用法原則，國語羅馬字拼音法式等等問題。　這都好像是就在眼前的事情。　半農的詩調往往好像已經帶了音樂的"swing"在裏頭，這些年來跟他編曲和討論樂律問題也都像成了一種習慣似的。　最近他到綏遠寧出發時候寫來的一封信還是提到作歌的事情，那曉得這封信到了不久，跟着就得到他的死耗了。

半農跟歷史語言研究所的關係的歷史就跟歷史語言研究所到現在的歷史一樣長。從他在本所發刊的東西

聲調之推斷及『聲調推斷尺』之製造與用法　民十九　集刊一本二分

宋元以來俗字譜　　　與李家瑞合編　民十九

中國俗曲總目	與李家瑞合編	民二十
燉煌瑣瑣上輯		民二十
燉煌瑣瑣中輯		民二十一

裏，我們已經覺到以後不能再有這些貢獻的損失，何況再看他全部的學術上與文藝上的貢獻，又想到我們當中以後不能再有這末一個朋友，常常……還，還寫得下去嗎？

二十三年十月十七日趙元任在南京記。

白滌洲君遺像

白滌洲小傳

白滌洲名鎮瀛，以字行，北平人，其先出自蒙古白濟特氏。 民國四年（一九一五），年十六，入北京師範學校，堅苦自勵，毎試輒列前茅。 畢業後，歷任前京師公立第十七及第七小學校長，興革得宜，訓育有方，前京師學務局局長張仲蘇（謹）極器重之。 民國九年（一九二〇），入國語講習所研究國語國音，以頭腦之精敏，平語之流利，故成績斐然，為儕輩冠；黎劭西先生因引為青年同志，約其共同戮力國語運動。 此後十五年間，關於國語國音之講習，討論，宣傳，視察，編輯，君幾無役不與。 十五年（一九二六）國語統一籌備會着手增修之國音字典，二十一年（一九三二）教育部公布之國音常用字彙，初稿均出自君手：其在國語運動史上之偉績，殆可與陸詞之於切韵，周德清之於中原音韵相比擬也。

民國十三年（一九二四），君有志深造，毅然辭校長職，考入北京大學預科乙部。 以其餘暇佐顧孟餘先生辦理前北京教育會會務，略得微酬，藉助膏火，兼供仰事俯畜之資，儉約自給，未嘗求助於人，友朋援濟，皆善謝之。 十五年（一九二六）入本科英文系，十七年（一九二八）轉國文系，從錢玄同馬幼漁劉半農諸先生治中國聲韵學及語音學，並能啓發其天才，獲得切實之工具。 於時君已兼任教育部國語統一籌備委員會常務委員及中國大辭典編纂處整理部主任，畢業北大（一九三〇）更任北平市立師範學校教務主任；事務叢脞，而能不廢所學，且參加本所第二組之語音訓練班，從趙元任先生實習聽寫方言。 其所著北音入聲演變考，集韵聲類考，廣韵聲紐韵部之統計，廣韵通檢，廣韵入聲今讀表等，均於此期間陸續完成，以勤敏犀利之精神，為實事求是之工作，努力猛進，迥異尋常。 君所為文多歸納，少推想，長於排比統計，而不為非常可喜之論，時流或有譏其庸者，然數年之內，百忙之中，已侒侒若此，其庸亦殊不可及也！

二十一年（一九三二）歲杪，君長子藍及原配徐鑑溪女士，於一週之內相繼殤逝，次年（一九三三）一月，復丁父憂；摧鉅痛深，悲苦異常。 適傅孟真先生讀君所作北音入聲演變考喜其條通規律，足以正訛明變，擬請君調查豫晉秦隴之入聲變讀情況以

證實其結論。 君遂於是年三月應本所聘赴陝西調查方言，努力工作以排遣煩悶，六月之間，凡調查音系四十二縣，並搜集民間歌謠多種。 八月半返平，月終即到上海向本所報告調查經過，並爲中華書局灌製標準國語國音留聲機片。 十月底復應劉半農先生召北來，任北大研究院文史部語音樂律實驗室助教，得暇輒整理陝西調查材料。 十一月半與武進徐淬女士結婚，蜜月之中，不輟所業，其所作關中入聲之變化及關中四聲實驗錄內之聲調曲線即於是時畫成，一時傳爲佳話，媲美於呂祖謙之東萊博議：其敬事負責，有如此者。

二十三年（一九三四）六月半，君隨劉半農先生赴歸綏調查方言，盛暑工作，歷時三週。 歸來，即值半農先生之喪。 於勞頓悲痛之餘，復受國語統一籌備委員會命，赴長安講演國音，八月折往武進，伴其夫人歸寧，返平未及一月，又於九月二十三日赴鄭州出席國語羅馬字全國代表大會，三月之間，僕僕數千里，未嘗一日寧息，體敝神疲，傷寒菌遂乘虛侵襲，歸平病乃轉劇，竟於十月十二日上午四時歿於北平林葆駱醫院，得年僅三十有五，英年遽逝，聞者無不惋惜！ 蓋君賦性誠篤，見義勇爲，舍己從人，勞怨自任：其堪供人悼傷者；固不止學術上之損失已也！

半農滌州逝世後，陶燠民亦以病死瑞士閩。 燠民福建閩侯人，清華大學文學院哲學系畢業，曾任本所第二組助理員，著有閩音研究載集刊第一本第四分。 以國內治語言學者之希而一年之內共弱三人，其在國外則勞佛（Berthold Laufer）亦於九月十三日在芝加哥墜樓殞命，厄運同遭，殊可慨已！

中華民國二十三年十一月十一日，羅常培述於北平北海靜心齋。

白滌洲君著述提要

甲　整理

一、北音入聲演變考（民國二十年四月刋入女師大學術季刋第二卷第二期）

自元周德淸中原音韻以入聲派入平上去三聲，北音入聲演化之迹已著。　歷明淸兩代，如熊士伯，李汝珍等皆嘗有志整理，但均未得其條貫；君融貫各家之說，證以北平今讀，歸納成『全淸全濁變陽平，次淸次濁變去聲』之規律。

二、集韻聲類考（民國二十年十二月刋入中央研究院歷史語言研究所集刋三本二分）集韻一書大系依據廣韻，但其中反切用字及聲紐韻類有無異同，尙未經人探討，且傳世版本譌舛頗多，中外學者皆無從致力。　君先取諸本詳加校勘，次用番禺陳蘭甫氏切韻考方法繫聯集韻反切上字，成集韻聲類考一篇，結果定爲三十九類：泥娘不分，牀禪不分，均與廣韻不同。

三、廣韻聲紐韻部之統計（民國二十年四月刋入女師大學術季刋第二卷第一期）

此文統計廣韻反切上下字，訂聲紐四十七類，韻部二百九十類。

乙　纂輯

四、國音常用字彙

民國二十一年由教育部公布之國音常用字彙初稿爲君所主編，完成新定國音標準。

五、廣韻通檢（民國二十年油印本，）

廣韻一書，分韻苛細，據音求字，頗難檢尋。　君據字典部首，逐韻改排，並附注「紐」「呼」「調」「韵」及其國韵今讀。

六、廣韵入聲今讀表（十九年）

君旣考見北音入聲演變之規律，因取廣韵入聲韵字，逐一注明今讀。

七、國音字典稿本

國音標準旣經决定採用北平音，遂於十五年秋著手增修國音字典，是年初次議决之稿本，撰寫改削亦出自君手。

八、注音符號無師自通

此書初稿爲君所編，出版在民國十九年教育部編注音符號傳習小冊之前。

九、平民字典稿本

此書係民國十四年爲平民敎育促進會所編。

丙　實驗

十、關中入聲之變化（二十二年稿）

二十二年三月中央研究院歷史語言研究所派君往陝西調查舊關中道所屬方言，歷時半載，所得材料甚多。　返平後先整理其中關於入聲部分，以成斯篇。　已刊入慶祝蔡元培先生六十五歲論文集。

十一、關中四聲實驗錄（二十三年稿）

此文亦關中方言調查材料之一部分，實爲劉半農先生四聲實驗錄之惟一嗣響。已刊入中央研究院歷史語言研究所集刊第四本第四分。

十二、關中音系稿

全稿包括陝西舊關中道所屬四十二縣方音系統，參用應用語音學及實驗語音學之方法，謹嚴細密，惟尙待整理。

十三、標準國音國語留聲機片

二十二年八月，君應中華書局之聘赴滬攝製標準國音國語留聲機片十二張。

十四、北平聲調之研究

此係君在北大語音樂律實驗室任職時經劉半農先生指導所作之專題研究，對於趙元任先生『賞半』之說略有修正。

十五、河北方言紀錄

稿藏北大語音樂律實驗室。

十六、黟縣同音字注音

此文將在國學季刊發表。

十七、歸綏方音調查

二十三年六月十五日，君隨劉半農先生赴歸綏調查方言。　此部分材料，現存北大語音樂律實驗室。

國立中央研究院歷史語言研究所

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